TRAWL SURVEY OF SHRIMP AND FORAGE FISH ABUNDANCE IN ALASKA'S WESTWARD REGION, 2002

By

David R. Jackson

Regional Information Report[1] No. 4K03-45

Alaska Department of Fish and Game
Division of Commercial Fisheries
211 Mission Road
Kodiak, Alaska 99615

September 2003

[1] The Regional Information Report Series was established in 1987 to provide an information access system for all unpublished division reports. These reports frequently serve diverse ad hoc informational purposes or archive basic uninterpreted data. To accommodate timely reporting of recently collected information, reports in this series undergo only limited internal review and may contain preliminary data; this information may be subsequently finalized and published in the formal literature. Consequently, these reports should not be cited without prior approval of the author or the Division of Commercial Fisheries.

ACKNOWLEDGEMENTS

Staff from the Alaska Department of Fish and Game provided important assistance in the completion of the 2002 shrimp and forage fish trawl survey and this report. *R/V Resolution* Captain Ron Kutchick and crew, Dan Wilson and Denis Cox, Jr., Fish and Wildlife Technicians Tom Dinnocenzo and Carl Peterson, and biologist Paul Anderson of National Marine Fisheries Service were all essential during the at-sea survey work and data collection. Carl Peterson completed sexed length frequencies of strata samples in the laboratory and Allison Birdsong performed data entry. Many thanks to database manager Ric Shepard for extensive programming and data retrieval and to publications specialist Lucinda Neel, for invaluable assistance with report formatting.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Cont.)

LIST OF APPENDICES

ABSTRACT

The Alaska Department of Fish and Game (ADF&G) conducted a small-mesh bottom trawl survey for shrimp and forage fish from September 17 to October 16, 2002 in waters of the Westward Region's Kodiak, Chignik, and South Peninsula commercial shrimp fishing districts. The purpose of the survey was to assess relative pandalid shrimp biomass within these districts and compare the results to established fishery thresholds. Secondary objectives included obtaining species composition data and length frequencies from commercially important groundfish and shrimp, generating relative density estimates for forage fish, and tagging Pacific cod *Gadus macrocephalus* as part of an ongoing mark-recapture study.

A standard, high-opening, shrimp research trawl net with 3.1-cm stretch mesh throughout the mouth, body, and codend was used to complete 108 tows. Stations were selected in established strata using a random number generator with tows conducted for a standard distance of 1.85 km. The entire catch of each tow was weighed and sorted by species with a subsample examined to determine proportions of small animals. Commercially important groundfish, shrimp, and forage fish were sampled for species identification and size characteristics. Population estimates for shrimp were generated using an area swept technique.

Wide Bay in the Kodiak District produced the only shrimp population estimate above the department's established minimum acceptable biomass index (MABI), the criteria used as a threshold for opening commercial shrimp fishing. Wide Bay is within a non-pelagic trawl closure area precluding a commercial trawl shrimp fishery, as standard shrimp trawl gear is non-pelagic. All other surveyed sections remain below MABI levels required for consideration of commercial fishery openings. Most sections remain well below historic population levels, but have shown some increase in recent surveys.

Catch composition in the 2002 survey was approximately 16% shrimp and 84% fish. The primary shrimp species captured was the pink or northern shrimp *Pandalis borealis.* Walleye pollock *Theragra chalcogramma*, flathead sole *Hippoglossus elassodon*, and arrowtooth flounder *Atheresthes stomias* comprised the majority of fish catches. Forage fish were found throughout these districts with eulachon *Thaleichthys pacificus* and Pacific sandfish *Trichodon trichodon* occurring most frequently.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) conducted a small-mesh bottom trawl survey for shrimp and forage fish from September 17 to October 16, 2002. The survey focused on historically productive shrimp areas in inshore waters around Kodiak Island, Shelikof Strait, and bays along the south side of the Alaska Peninsula. Sampling occurred in the Kodiak, Chignik, and South Peninsula shrimp management districts of Westward Registration Area J listed in Title 5 of the Alaska Administrative Code chapter 31 (Figure 1). Districts have been further divided into sections for fishery management purposes (Figure 2). The survey was a platform of opportunity for assessing forage fish distribution and abundance.

Shrimp have been commercially harvested around Kodiak Island since 1958 and along the south side of the Alaska Peninsula since 1968. Total landings averaged more than 50 million pounds per year during the 1960s and 1970s (Figure 3). The pink or northern shrimp *Pandalus borealis* comprised more than 85% of the catch, but humpy shrimp *P. goniurus*, coonstriped shrimp *P. hypsinotus*, and sidestriped shrimp *Pandalopsis dispar* all made significant contributions to the harvest, which was primarily taken with trawl gear (Gaffney 1981). Other shrimps taken incidentally include several species from the families Crangonidae and Hippolytidae. Spot shrimp *P. platyceros* and coonstriped shrimp have occasionally been the target of minor pot fisheries. Little activity for trawl shrimp has occurred since 1982 as stock abundance and fisheries declined sharply with changing oceanographic conditions (Anderson 2000). Production has averaged less than 10,000 pounds per year since 1986 (Jackson and Ruccio 2003)

ADF&G began research on pandalid shrimp in 1968 with a commercial fishery logbook program. The objectives of this program were to establish baseline data on relative stock abundance and to define basic life history parameters for the primary species involved in the commercial fisheries (Jackson et al. 1983). The trawl survey stock assessment program began in 1970 to provide directly comparable stock abundance indices and monitor recruitment, growth, and the effects of fishing on the population age structure. Successive indices for a given stock were shown to track fluctuations in relative abundance over time (Jackson 1979). A management strategy developed in 1979 directly utilized survey results as the primary data source for harvest level determination. Harvest levels were based on proportions of abundance index thresholds. The management goal was to achieve maximum harvests without affecting reproductive potential. The strategy was based on trends in stock abundance relative to a representative biomass index (RBI). This level is defined as the mean abundance estimate obtained after initial exploitation but prior to the abundance decline. It was thought that recovery to this level could reasonably be expected. Based on the RBI, a second level called the minimum acceptable biomass index (MABI) was established at 40% of the RBI level. Stocks for which abundance levels were less than the prescribed MABI were considered severely depressed and no fishing was allowed (ADF&G 1982). The management plan approved by the Alaska Board of Fisheries (BOF) in 1982 detailed RBI and MABI levels for 26 fishing sections (Table 1).

ADF&G conducted spring and fall stock assessment surveys for shrimp during the years when shrimp abundance was high and commercial fishing effort was at its greatest level. As stocks declined and commercial fishing effort decreased, the level of research conducted by ADF&G also decreased. Trawl assessment surveys of shrimp stocks were first reduced from spring and

fall surveys to a single fall survey in 1986. Further funding reductions resulted in the shrimp survey being conducted biennially beginning in 1987 and triennially from 1989 to 2001. The scope of areas covered by the shrimp surveys has also declined since the early 1980s as a function of budget constraints. Additional funding from the National Marine Fisheries Service (NMFS) to extend their Pavlof Bay small-mesh trawl data series and monitor long-term changes of the species community structure in the Gulf of Alaska (GOA) was the basis for an additional survey in 2002.

Forage fish populations have recently come under increased scrutiny by federal and state regulatory bodies. In 1998, the North Pacific Fishery Management Council and in 1999 the BOF, adopted prohibitions on the directed take of forage fish in the North Pacific and Bering Sea. Both groups recognized the importance of forage fish in the transfer of energy from primary to secondary producers in the marine ecosystem as well as being important food for marine mammals and many commercial groundfish species. ADF&G has not conducted forage fish research per se, but catch data from prior shrimp or small-mesh trawl surveys has provided important information to other agencies and researchers. Changing species composition documented from the long term, regular assessment program has given insight on the effects of changing oceanographic conditions (Anderson et al. 1997a and 1997b, Anderson and Piatt 1999).

OBJECTIVES

The primary objective of the 2002 small-mesh trawl survey was to assess the relative stock abundance of shrimp in the historically productive sections of the Kodiak, Chignik, and South Peninsula Districts. Population estimates were compared with established MABIs to determine the potential for commercial fishery openings.

Secondary objectives of the 2002 survey were to:

- Determine species composition of the catch by haul and survey area.
- Obtain length frequency distributions for commercially important shrimp and fish species.
- Obtain composition samples of shrimp for each stratum surveyed and analyze each sample for sex and length frequency.
- Compare relative abundance of shrimp to recent and historic survey data to make inferences about population trends.
- Generate density estimates for forage fish species from the areas trawled.
- Floy-tag[1] Pacific cod *Gadus macrocephalus* captured during the survey as part of an ongoing mark-recapture project to study migration and growth patterns of that species.

[1] Use of trade names does not constitute an endorsement by ADF&G.

METHODS

Trawl Description and Survey Procedures

The 27.4 m ADF&G research vessel *Resolution* was used to trawl areas of known historic shrimp habitat and areas of historic commercial exploitation. An 18.6 m small-mesh trawl with a three bridle, high-opening was used. The gear was initially developed by NMFS and adopted as the standard for shrimp trawl research by NMFS, ADF&G, and Canadian researchers in British Columbia. This net has an 18.6 m footrope with a 17.0 m tickler chain suspended by 29 cm dropper chains. Astoria semi- vee trawl doors weighing 340 kg each and measuring 1.7 m x 2.7 m were attached with three 18.2 m dandylines (1.8 cm in diameter) to hold the net open. Flotation was achieved by using twenty-nine 16.6 cm floats. The net was constructed with 3.1 cm stretch mesh through the mouth, body, and cod end. Electronic net measurement systems and scuba observations have shown this net opens to an average width of 9.8 m and to a height of 4 m (Watson 1987).

Bays to be surveyed were divided into strata based on known historic shrimp population areas. In some smaller bays, this division was not utilized. Within the stratum or bay, each survey area was divided into blocks of four stations with a station encompassing approximately 3.4 km^2. One station within each block was selected using a random number generator. If the station was determined to be untrawlable, the closest adjacent station within the four-station block with trawlable bottom was selected. The trawl net was towed at a speed of 3.7 km/h and for a distance of 1.85 km. Several stations were not trawled for the full 1.85 km due to untrawlable bottom types. Total distance towed was recorded by Differential Global Position System (DGPS) readings.

Total catch from each trawl haul was weighed to the nearest two-kilogram increment by lifting the cod end with a crane scale. The entire haul was sampled for commercially important species including: sablefish *Anoplopoma fimbria*, Pacific cod, walleye pollock, Pacific halibut *Hippoglossus stenolepis*, all rockfish species *Sebastes* and *Sebastolobus*, lingcod *Ophiodon elongatus*, Giant Pacific octopus *Octopus dofleini*, all salmon species *Oncorhynchus sp.*, all sharks in the families Lamnidae and Squalidae, all skates in the family Rajidae, Dungeness crabs *Cancer magister*, king crabs *Paralithodes sp.* and *Lithodes sp.*, Tanner crabs *Chionoecetes sp.*, and Pacific herring *Clupea pallasi*. In many instances, adult and juvenile animals were sampled differently (e.g., adult walleye pollock were whole-haul sampled, while juvenile pollock were subsampled). In addition, giant wrymouth *Cryptacanthodes giganteus* and large pieces of debris were whole-haul sampled because these items were not likely to be taken in a subsample split.

A 1.5 m^2 splitting net with a 3.1 cm mesh liner was used to obtain a subsample of the total catch. The splitting net was tied into the sorting bin before the haul was dumped from the cod end. The splitting net was then lifted up though the catch by hydraulic crane and the subsample moved to a sorting table for further assessment (i.e., table subsample). The entire table subsample and animals that were whole-haul sampled were then identified to species, enumerated, and weighed to the nearest kilogram. A second subsample of shrimp (i.e., shrimp-only subsample) was taken from the initially selected table subsample to determine shrimp species composition. This shrimp-only subsample was weighed to the nearest gram.

All commercially important groundfish species were measured to obtain size frequency distributions. Fish species were measured from snout tip to fork or mid point of the caudal fin. From each trawl station where sufficient shrimp were available, 200 shrimp (typically pink shrimp) were measured from the right eye socket to the midpoint on the posterior margin of the carapace to the nearest 0.5-mm.

A composite sample of shrimp was collected from all hauls within each stratum. This sample was preserved in ethyl alcohol to be sexed in the laboratory after the completion of the at-sea portion of the survey. The primary pandalid shrimp in the strata composition samples were identified to species, measured, weighed, and sexed using techniques described in Butler (1980).

Shrimp Population Estimation

Shrimp population estimates for each stratum from the 2002 trawl survey were derived using an area-swept technique (Alverson and Pereyra 1969). The estimates from each stratum were totaled to provide an abundance index for each section. Based on net performance data, it is assumed that the trawl swept a path 9.8 m wide and the total area swept by the trawl in a one km tow was 1/102 km^2. All tows were recorded in nautical miles and converted to kilometers (nautical miles x 1.852 = kilometers towed). In instances where tow distance was either less than or greater than l.85 km, catch data was proportioned accordingly. The catch of shrimp per one kilometer tow was converted into a kg per km^2 density estimate by multiplying by a factor of 102, or the number of net widths in a kilometer. The density was then multiplied by the total area (km^2) within a stratum that was considered shrimp habitat to generate the population index:

Population index = shrimp kg/km towed x 102 (area swept) x station or stratum size (km^2)

Some assumptions are undertaken in using the area swept technique. First, it is assumed that all the shrimp within the trawl path are caught. Secondly, it is assumed that the total area considered contains all the shrimp within that selected station or strata. As these assumptions may not always be the case, the generated population estimate is a relative and not an absolute index. In addition, estimates are for all species of shrimp captured in survey trawls and not just those fished commercially. Spot shrimp or 'prawns' *P. platyceros* and coonstriped shrimp *P. hypsinotus,* are commonly found in steep, rocky substrate and are not well sampled by trawl gear. Therefore, their population densities are not well estimated using this technique.

RESULTS

One hundred eight trawl hauls were sampled in waters around the Kodiak archipelago and south of the Alaska Peninsula during the 2002 survey (Figure 4). Survey haul parameters such as tow start and end position, date, depth, bottom temperature, and catch were collected for each haul (Appendix A).

Groundfish, Pacific halibut, and various invertebrates accounted for the majority of the total catch by weight. Walleye pollock were 32% of the total weight, followed by flathead sole

(21.1%), shrimp (15.5%), arrowtooth flounder (12.7%), jellyfish (5%), and Pacific cod (3.2%) (Table 2). Within the shrimp species, 12.3% of the total weight were pink shrimp, 2.3% humpy shrimp, 0.6% coonstriped shrimp, and 0.4% sidestriped shrimp. Other non-commercial shrimp species comprised 0.1% of the survey catch. More than 13,000 length measurements were taken from 26 groundfish species and Pacific halibut. Mean sizes ranged from 8.3 cm for capelin to 70.9 cm for big skate (Table 3). Detailed length frequencies are provided for the most commonly measured fish in Appendix B.

Forage fish were captured throughout the survey area totaling 3.4% of the survey catch by weight. Eulachon were the most abundant occurring in 55% of the trawl hauls and comprising 2.5% of the catch by weight. Pacific sandfish was next with 0.9% of the sample weight. Other forage fish species caught included longsnout prickleback *Lumpenella longirostris*, capelin *Mallotus villosus* and rainbow smelt *Osmerus mordax*.

Shrimp Populations

Pink shrimp were captured in 96% of the survey hauls, averaging 30.3 kg/km towed. The highest density was found in Wide Bay on the Alaska Peninsula in the Kodiak District where hauls averaged 306.7 kg of pink shrimp per km towed (Figure 5). Further west, Ivanof and Stepovak Bays near Kupreanof Point on the Alaska Peninsula had few shrimp and the lowest densities (Table 4). Relative shrimp population estimates followed a similar pattern, but varied somewhat because of habitat considerations. Results from stations in the Marmot Island Section of the Kodiak District produced the largest estimated shrimp population at 1,356 metric tons (mt). The Wide Bay estimate was second highest at 791 mt.

Carapace lengths were recorded from 17,356 pink shrimp according to survey protocol. The average size for all pink shrimp measured onboard was 17.1 mm carapace length (CL) (Figure 6). Average size was largest in the Marmot Island, Chiniak Bay and Kujulik Bay Sections, while recruitment of young shrimp to mature sizes appeared strong in Kiliuda Bay hauls (Figure 7).

Composite samples of pink shrimp collected by strata and section were examined in the laboratory for size and sex characteristics of the populations. (Figures 8-11). Few ovigerous female or transitional stage shrimp were observed due to the timing of the survey. Most shrimp transitioning from male to female appear to have completed this change by the time of the survey. The breeding season was just beginning as egg-bearing females began appearing more frequently in sample hauls late in the survey. Pavlof Bay had the smallest females, 14-mm CL. Evidence of future recruitment in the Marmot Island sample was noted in specimens measured in the 7.0-mm range.

Humpy shrimp were only found in Wide Bay with the exception of a minor occurrence in Kujulik Bay (Figure 12). Sampled humpy shrimp averaged 16.9 mm carapace length. Sidestriped shrimp were more widespread, occurring in 31% of the trawl hauls with greatest concentrations in the Marmot Island and Chignik Bay Sections (Figure 13). Sidestripes measured from Marmot Island averaged 22.5 mm CL.

Forage Fish Distribution

Eulachon were the most abundant forage fish, present in 61% of the survey samples. The highest catch was in Stepovak Bay with densities above average along the Alaska Peninsula from Chignik Bay to Unga Strait (Figure 14). Eulachon averaged 6.7 kg per km towed from all survey hauls. Several age classes were present with sizes ranging from 6 to 24 cm. The mean length of eulachon captured was 16.7 cm and young fish at 7-9 cm were common in Ivanof and Kuiukta Bays. Pacific sandfish were the second most abundant of the forage fishes but found in only 18% of the hauls. The largest catches occurred in Wide and Kujulik Bays, two of the shallowest bays sampled (Figure 15).

Tagged Pacific Cod

Pacific cod have been shown to be a significant factor in shrimp natural mortality (Albers and Anderson 1985). ADF&G has been studying fish movements and growth for the past five years. During the 2002 small-mesh survey, 272 Pacific cod were tagged and released with an orange spaghetti-type Floy-tag in the first dorsal fin. Commercial fishermen recovered three of the released fish as of March 31, 2003.

Bottom Temperatures

Water temperature readings were recorded from each tow during the survey using a thermograph attached to the headrope of the trawl. The coolest ocean floor temperatures were found in Unga Strait and Stepovak Bay with the warmest waters found in Kujulik and Wide Bays. The mean survey bottom temperature was 7.2°C with a range from 5.0°C to 10.1°C (Figure 16).

DISCUSSION

Shrimp populations were lower in 2002 than the previous year, but similar to levels last observed in mid 1980s. Shrimp comprised 15.5 % of total catch in 2002 as compared with 26% in 2001 (Figure 17). Lower population estimates were generated in 4 of the 5 sections that were surveyed in both years. Only the Kiliuda Bay Section showed an increase in 2002 over 2001 (Table 5). Despite a reduced 2002 estimate from Inner Marmot Bay, Marmot Island and Wide Bay, those sections were above any levels observed prior to 1992. The decrease in overall shrimp abundance in survey catches from 2001 to 2002 is also partially attributable to the shift in survey effort to the west, where shrimp densities were lower.

The primary objective of the survey was to compare shrimp population estimates with established MABIs and determine the potential for commercial fishery openings. All surveyed stocks with the exception of Wide Bay were below their MABI and considered severely depressed. Wide Bay, part of the Mainland Section, produced the only estimate above the MABI required for a fishery. However, Wide Bay also remained closed to fishing because it is completely encompassed by a non-pelagic trawl closure area. The trawl closures extend to all on

bottom trawl net types including shrimp otter trawls and beam trawls. The remaining sections surveyed remained closed to fishing as results indicated stocks were below MABI levels.

A well documented ecological shift from dominant shellfish to dominant groundfish populations occurred with a warming of Gulf of Alaska waters beginning in the late 1970s. Temperatures in recent years have been cooler but an overall trend has not been clearly established. Ocean bottom temperatures recorded on the 2002 survey were largely warmer than optimum for pandalid shrimp. Temperatures of 3°C to 6°C were found ideal for larval development in the laboratory (Nunes 1984). The most common range for large pink shrimp populations has been reported as between 0°C and 5°C (Shumway, et al. 1985). Only 15% of the hauls from 2002 exhibited ocean bottom temperatures of 6°C or lower. Unless cooler waters prevail in the Gulf of Alaska it is not likely shrimp populations will rebound to former levels in the short term.

An exception to the prevailing evidence of greater shrimp productivity with cooler water occurs in Wide Bay on the south side of the Alaska Peninsula. This relatively shallow bay is nearly enclosed by a series of barrier reefs between the bay and Shelikof Strait. In both the 2001 and 2002 surveys, this bay had some of the highest bottom water temperatures and yet also had the highest shrimp densities. In contrast, a similar shallow bay located 50 miles to the southwest, Kujulik Bay also showed relatively high water temperatures but exhibited some of the lowest shrimp densities on the survey. Kujulik Bay does not have the protective reef system occurring across the mouth of the bay and perhaps that accounts for high shrimp densities associated with the warm temperatures in Wide Bay.

Of the forage fishes, eulachon were caught most frequently and in greatest abundance on the survey. They are an important prey item for marine mammals as well as other fish species, however little is known of the eulachon population structure in Alaska. Although not part of the sampling protocol, eulachon were often checked for sex. About 95% of the fish captured on the small-mesh survey were males. This was a surprising finding to the researchers onboard and will be formally investigated during future surveys.

Perhaps the greatest value of this survey is the continuation of the time series for small-mesh trawl samples. Marine fishery management is moving away from a single specie approach based on static oceanographic conditions that do not, in practice, exist. It is now recognized that effective and sustainable use of resources requires more understanding of ecosystem processes and how they are affected by changing environmental and human influences. Foremost in research priorities must be the continuation of systematic studies of the marine ecosystem if the effects of those influences are to be examined. The small-mesh trawl survey series has documented species composition of shrimp and fish in the Gulf of Alaska for over 30 years and will continue to provide important clues for researchers trying to understand the ecology of the North Pacific Ocean.

The next small-mesh trawl survey in the Westward Region is scheduled for September 2003. Commercial shrimp fishing sections in the Kodiak District will be the focus of that sampling effort.

LITERATURE CITED

Alaska Department of Fish and Game (ADF&G). 1982. Westward Region Shrimp Fishery Management Plan, Revision 1, April 1982. Unpublished manuscript Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K82-10, Kodiak.

Albers, W.D., and P.J. Anderson. 1985. Diet of the Pacific cod, *Gadus macrocephalus*, and predation on the Northern pink Shrimp, *Pandalus borealis*, in Pavlof Bay, Alaska. Fish. Bull.U.S. 83: 601-610.

Alverson, D.L., and W.T. Pereyra. 1969. Demersal fish explorations in the northeastern Pacific Ocean-an evaluation of exploratory fishing methods and analytical approaches to stock size and yield forecasts. Jour. Fish. Res. Board of Canada 26: 1985-2001.

Anderson, P.J. 2000. Pandalid Shrimp as Indicators of Ecosystem Regime Shift. J. Northw. Atl. Fish. Sci., Vol. 27: 1-10.

Anderson, P.J., J.E. Blackburn, and B.A. Johnson. 1997a. Declines of forage fish species in the Gulf of Alaska, 1972-95, as indicators of regime shift. *In*: Proceedings of the International Symposium on the Role of Forage Fishes in Marine Ecosystems, November 13-16, 1996, Anchorage, Alaska. B.S. Baxer (ed.) 1997. University of Alaska. Alaska Sea Grant Rep., 97-01.

Anderson, P.J., J.E. Blackburn, W.R. Bechtol, and J.F. Piatt. 1997b. Synthesis and analysis of Gulf of Alaska small-mesh trawl data, 1953 to 1996, and Gulf of Alaska forage fish icthyoplankton analysis, 1972 to 1996. Appendix L *in*: Duffy [ed.] *EXXON Valdez* Oil Spill restoration project annual report, APEX Project Alaska Predator Ecosystem Experiment in Prince William Sound and the Gulf of Alaska; Restoration project 96163LA-P, annual report.

Anderson, P.J., and J.F. Piatt. 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. Mar. Ecol. Prog. Ser., 189: 117-123.

Butler, T.H. 1980. Shrimps of the Pacific coast of Canada. Can. Bull. Fish. Aquat. Sci. 202: 280pp.

Gaffney, F.G. 1981. History of Research and Management of Alaskan Shrimp. *In:* Proceedings of the International Pandlid Shrimp Symposium, February 13-15, 1979, Kodiak, Alaska. University of Alaska. Alaska Sea Grant Report 81-3.

Jackson, D.R., and M.P. Ruccio. 2003. Kodiak, Chignik and South Peninsula Shrimp Fisheries and Their Management: A Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K03-7, Kodiak

LITERATURE CITED (Continued)

Jackson, P.B. 1979. Kodiak pandalid shrimp investigations. Comp. Rept. 5-42-R. Comm. Fish. Res. and Devel. Act. July 1, 1979-June10, 1980. 42 pp.

Jackson, P.B., L.J. Watson, and J.A McCrary. 1983. The Westward Region Shrimp Fishery and Shrimp Research Program, 1968-1981. Alaska Department of Fish and Game, Division of Commercial Fisheries, Informational Leaflet No. 216, Juneau.

Nunes, P. 1984. Reproductive and larval biology of Northern shrimp *Pandalus borealis* Kroyer, in relation to temperature. Ph.D. dissertation, Univ. of Alaska, Fairbanks, Alaska. 194p.

Shumway, S.E., H.C. Perkinks, D.F. Schick, and A.P. Stickney. 1985. Synopsis of biological data on the pink shrimp, *Pandalus borealis* Krøyer, 1838. NOAA Technical Report NMFS 30, FAO Fisheries Synopsis No. 144. May 1985. 57pp.

Watson, Leslie. 1987. ADF&G Shrimp Research Shrimp Trawl Survey Manual. Unpublished manuscript. Alaska Department of Fish and Game, Division of Commercial Fisheries, Research Operational Plan, Revised January 1987.

Table 1. Shrimp biomass indices from the Westward Region Shrimp Fishery Management Plan, 1982.

District	Section	RBI[a]	MABI[b]
Kodiak	Kiliuda Bay	5,989	2,405
	Two Headed Island	8,258	3,312
	Ugak Bay	4,537	1,815
	Alitak Bay (Strata 2)		
	Pink Shrimp	2,405	962
	All species	4,855	1,942
	Alitak Flats (Strata 3)	3,176	1,270
	Marmot Island	28,993	11,615
	Inner Marmot Bay	4,128	1,652
	Chiniak Bay	1,637	658
	Uganik Bay	2,931	1,175
	Uyak Bay	3,621	1,447
	Wide Bay	1,184	476
	Puale Bay	1,352	540
Chignik	Chignik Bay	5,159	2,064
	Kujulik Bay	4,288	1,715
	Mitrofania Island	5,853	2,341
	Ivanof Bay	6,466	2,586
	Chiganagak Bay	780	313
	Aniakchak Bay	3,267	1,307
	Nakolilok Bay	926	372
	Kuiukta Bay	2,160	862
South	Stepovak Bay	26,302	10,526
Peninsula	Unga Straits	8,530	3,412
	West Nagai	7,473	2,976
	Beaver Bay	4,946	1,978
	Pavlof Bay	20,554	8,221
	Morzhovoi Bay	12,160	4,864

[a] Representative Biomass Index (metric tons)
[b] Minimum Acceptable Biomass Index (metric tons)

Table 2. Relative abundance by weight of the top 20 species, percentage of shrimp, and percentage of forage fish occurrence in the 2002 Westward region small-mesh trawl survey.

Rank	Common Name	Scientific Name	Percent of Catch by Weight
1	Walleye pollock	*Theragra chalcogramma*	32.0 %
2	Flathead sole	*Hippoglossoides elassodon*	21.1 %
3	Arrowtooth flounder	*Atheresthes stomias*	12.7 %
4	Pink shrimp	*Pandalus borealis*	12.3 %
5	Jellyfish unident.	Class Scyphozoa	5.0 %
6	Pacific cod	*Gadus macrocephalus*	3.1 %
7	Eulachon	*Thaleichthys pacificus*	2.5 %
8	Humpy shrimp	*Pandalus goniurus*	2.3 %
9	Yellowfin sole	*Pleuronectes asper*	1.1 %
10	Pacific Sandfish	*Trichodon trichodon*	0.9 %
11	Starry flounder	*Platichthys stellatus*	0.8 %
12	Pacific halibut	*Hippoglossus stenolepis*	0.7 %
13	Coonstriped shrimp	*Pandalus hypsinotus*	0.6 %
14	Northern rock sole	*Lepidopsetta polyxstra*	0.5 %
15	Rex sole	*Glyptocephalus zachirus*	0.5 %
16	Big skate	*Raja binoculata*	0.4 %
17	Sidestriped shrimp	*Pandalopsis dispar*	0.4 %
18	Spiny dogfish	*Squalus acanthias*	0.3 %
19	Alaska plaice	*Pleuronectes quadrituberculatus*	0.3 %
20	Plain sculpin	*Myoxocephalus jaok*	0.3 %
All other shrimp species			
	Common crangon	*Crangon communis*	0.05 %
	Eualus sp.	*Eualus* sp.	0.03 %
	Arctic argid	*Argis dentata*	0.01 %
	Ridged crangon	*Crangon dalli*	<0.01 %
	Spot shrimp	*Pandalus platyceros*	<0.01 %
	Barbed eualid	*Eualus barbatus*	<0.01 %
	Argis sp.	*Argis* sp.	<0.01 %
	Hippolytid shrimp unident.	Family Hippolytidae	<0.01 %
	Spiny lebbeid	*Lebbeus groenlandicus*	<0.01 %
All other forage fish species			
	Longsnout prickleback	*Lumpenella longirostris*	0.06 %
	Prickleback unident.	Family Stichaeidae	<0.01 %
	Capelin	*Mallotus villosus*	<0.01 %
	Rainbow smelt	*Osmerus mordax*	<0.01 %
	Daubed shanny	*Lumpenus maculatus*	<0.01 %
	Snake prickleback	*Lumpenus sagitta*	<0.01 %
All other animals		66 species	1.90 %

Table 3. Fish measurements from the 2002 Westward Region small-mesh trawl survey.

Common Name	Number Measured	Mean Length (cm)	Estimated Number Caught	Estimated Total Catch (kg)
Alaska plaice	28	48.9	85	116.4
Arrowtooth flounder	2,333	35.4	7,771	4,368.2
Bathyraja unid.	2	21.0	2	1.3
Big skate	7	70.9	7	146.3
Black rockfish	1	47.0	1	1.7
Capelin	8	8.3	25	0.6
Dover sole	13	38.8	45	41.7
Eulachon	2,625	16.7	20,859	850.4
Flathead sole	4,715	29.5	23,828	7,284.3
Light dusky rockfish	2	32.0	2	1.2
Longnose skate	4	64.0	4	41.5
Northern rockfish	6	20.5	9	1.4
Northern rock sole	73	36.6	253	174.5
Pacific cod	131	60.9	131	413.2
Pacific cod (juvenile)	2	10.0	4	0.1
Pacific cod (tagged)	270	60.1	270	671.6
Pacific halibut	58	61.3	61	249.3
Pacific herring	144	21.7	144	16.2
Pacific ocean perch	3	32.0	3	1.4
Pacific tomcod	67	21.5	410	44.3
Redbanded rockfish	1	25.0	1	0.3
Rex sole	248	30.1	816	171.0
Rougheye rockfish	41	31.1	53	28.5
Sablefish	95	40.6	151	106.8
Saffron cod	3	29.7	20	4.0
Spiny dogfish	37	78.8	37	118.9
Starry flounder	32	51.9	108	273.6
Walleye pollock	3,076	33.8	14,801	10,672.4
Walleye pollock (juvenile)	1,558	10.5	45,033	363.2
Yellowfin sole	314	33.3	802	379.0

Table 4. Shrimp population estimates from the 2002 Westward Region small-mesh trawl survey.

Survey Area	Stratum	No. Tows	Kg/Km	Sq. Km	Std. Error	Pop. Estimate (MT)
Inner Marmot Bay	2	8	52.1	106.19	17.14	568
	3	2	9.6	5.08	4.90	5
Section Total						573
Marmot Island	2	2	87.9	28.81	42.68	260
	3	4	111.6	52.48	47.57	601
	4	6	29.3	164.29	12.29	495
Section Total						1356
Chiniak Bay	2	2	3.9	10.46	3.49	4
	3	3	18.6	20.51	10.38	39
	4	1	4.5	7.03	-	3
	5	2	8.0	13.82	0.99	11
Section Total						57
Kiliuda Bay	2	2	13.0	13.69	11.92	18
	3	5	24.3	72.06	12.55	180
Section Total						198
Wide Bay	2	6	306.7	25.14	93.84	791
	3	1	0.2	3.16	-	0
Wide Bay Total						791
Mitrofania Island	2	2	14.7	60.02	0.17	91
	3	2	0.7	84.38	0.64	7
Section Total						98
Stepovak Bay	2	4	0.2	246.95	0.11	7
	3	3	14.0	109.76	3.67	158
	4	1	9.9	205.79	-	210
Section Total						375
Unga Straits	1	7	7.3	182.47	4.10	137
Pavlof Bay	1	15	1.1	303.20	0.71	36
Chignik Bay	2	8	40.9	115.59	8.99	486
	3	3	5.8	36.01	5.40	22
Section Total						508
Kujulik Bay	2	2	2.8	14.75	2.82	4
	3	2	1.1	64.83	1.01	8
Section Total						12

-Continued-

Table 4. (page 2 of 2)

Survey Area	Stratum	No. Tows	Kg/Km	Sq. Km	Std. Error	Pop. Estimate (MT)
Beaver Bay	1	2	1.2	82.32	1.23	11
Belkofski Bay	1	2	0.1	39.44	0.05	0
Ivanof Bay	2	1	1.1	69.04	-	8
	3	2	0.1	59.34	0.04	1
	4	2	0.0	84.89	-	0
	5	2	0.0	96.11	0.01	0
Section Total						9
Kuiukta Bay	1	4	29.2	54.54	11.51	163

Table 5. Minimum acceptable biomass indices (MABI) and shrimp population estimates in metric tons from surveyed Westward Region fishing sections, 1992-2002.

District	Section	MABI [a]	Survey Year 2002	2001	1998	1995	1992
Kodiak	Inner Marmot Bay	1,652	573	1,173	218	517	499
	Marmot Island	11,615	1,356	1,685	222	-	-
	Chiniak Bay	658	57	333	45	82	172
	Ugak Bay	1,815	-	42	-	-	-
	Kiliuda Bay	2,405	198	56	73	54	141
	Two Headed Island	3,312	-	56	63	54	504
	Alitak Bay	1,942	-	232	113	9	82
	Uyak Bay	1,447	-	344	154	195	68
	Uganik Bay	1,175	-	711	127	485	213
	Kukak Bay [b]	NA	-	187	45	14	-
	Wide Bay [b]	476	791	906	-	32	413
	Puale Bay [b]	540	-	48	-	-	-
	Shelikof Strait [c]	NA	-	1,056	-	-	-
Chignik	Kujulik Bay	1,715	12	-	-	-	-
	Chignik Bay	2,064	508	-	-	454	912
	Kuiukta Bay	862	163	-	-	163	313
	Mitrofania Island	2,341	99	-	-	-	-
	Ivanof Bay	2,586	9	-	-	-	-
South Peninsula	Stepovak Bay	10,526	375	-	-	-	-
	Unga Straits	3,412	137	-	-	-	-
	Beaver Bay	1,978	11	-	-	-	-
	Pavlof Bay	8,221	36	30	59	15	123
	Belkofski Bay	NA	1				

[a] Minimum acceptable biomass index

[b] Wide and Puale Bays are part of the Mainland Section; MABIs are established for each bay.

[c] General Section

NA = no MABI established for survey area.

- = Not surveyed in that year.

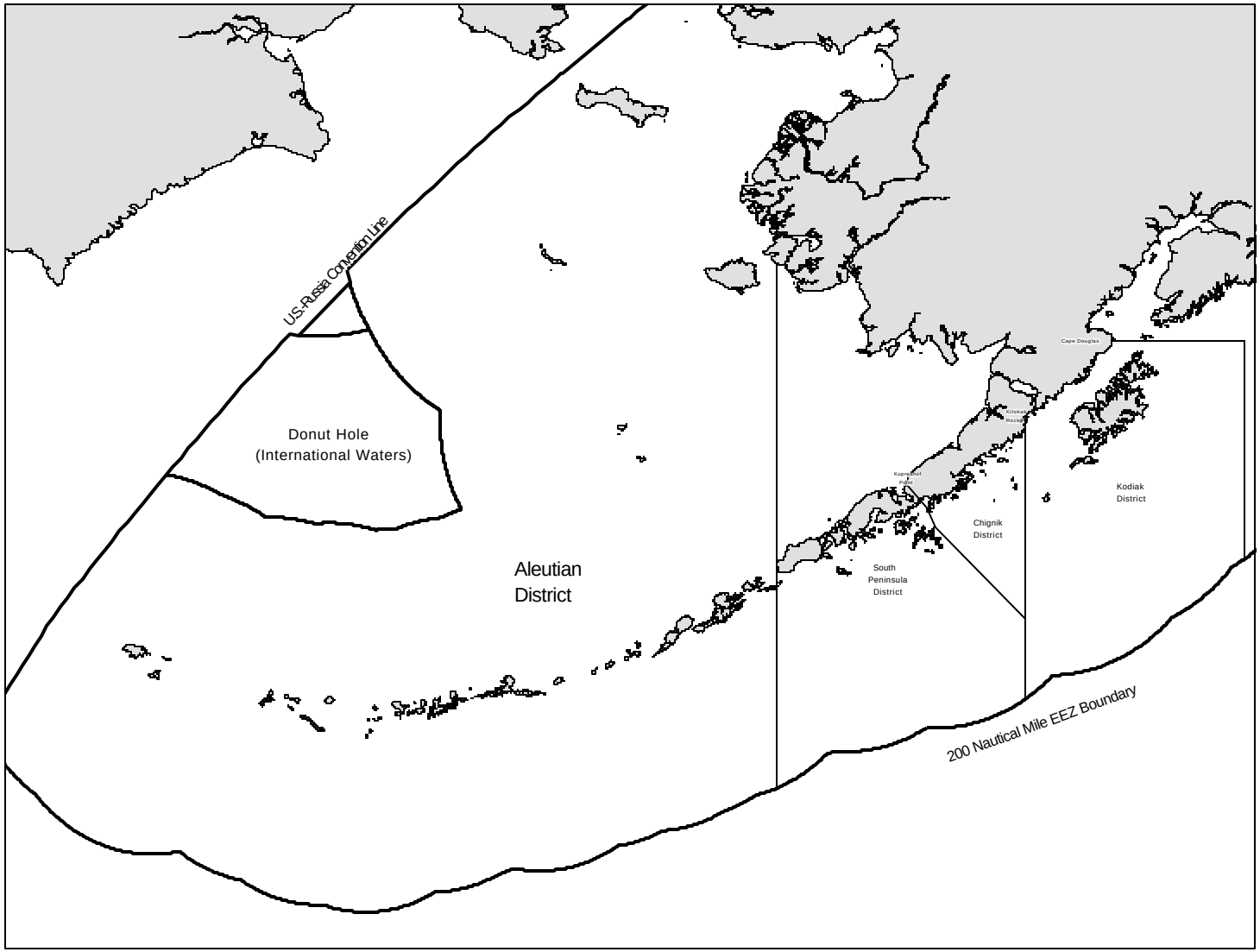

Figure 1. Commercial shrimp fishing districts of Westward Registration Area J.

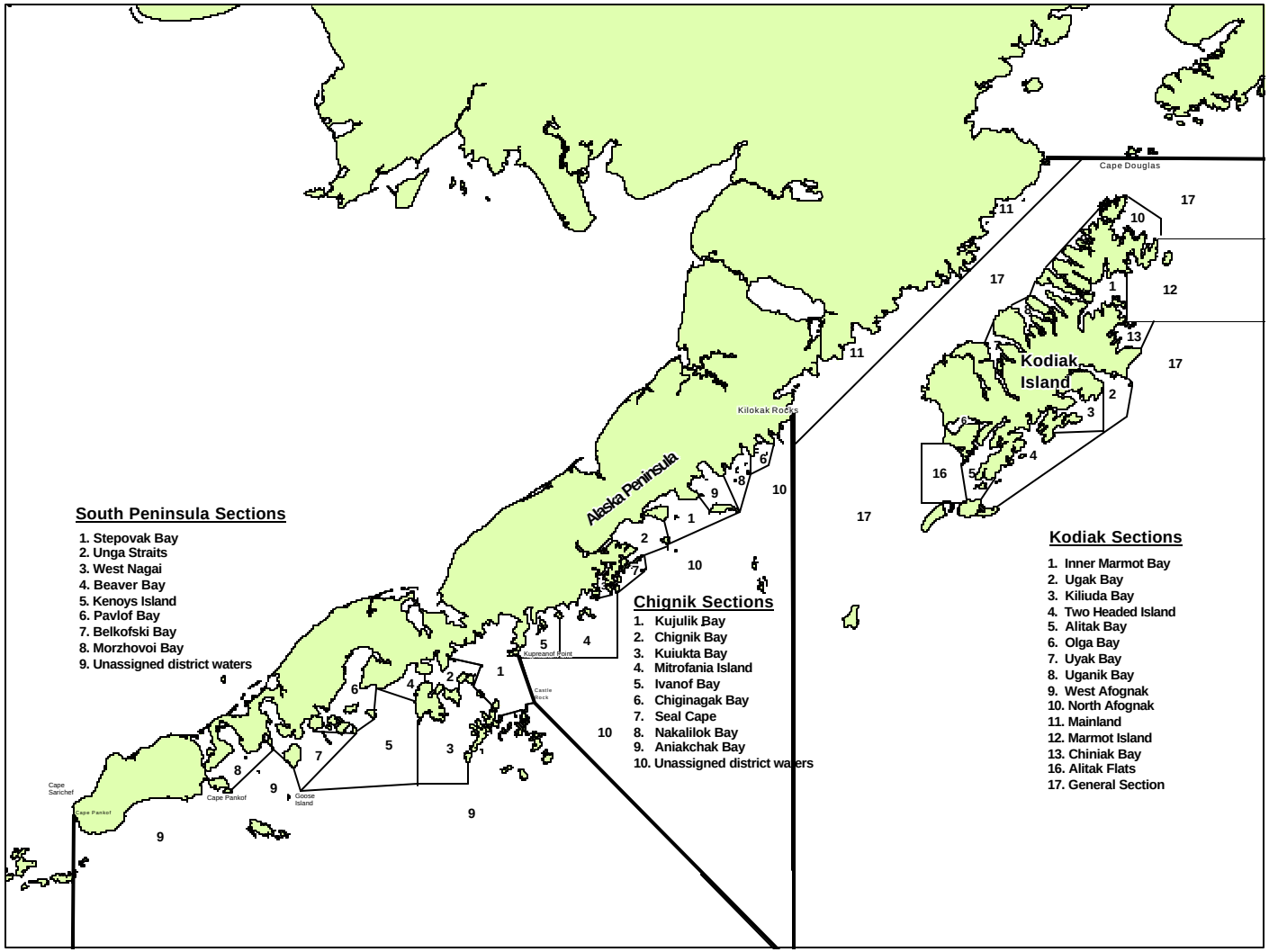

Figure 2. Commercial shrimp fishing sections in the Kodiak, Chignik, and South Peninsula Districts of Westward Area J.

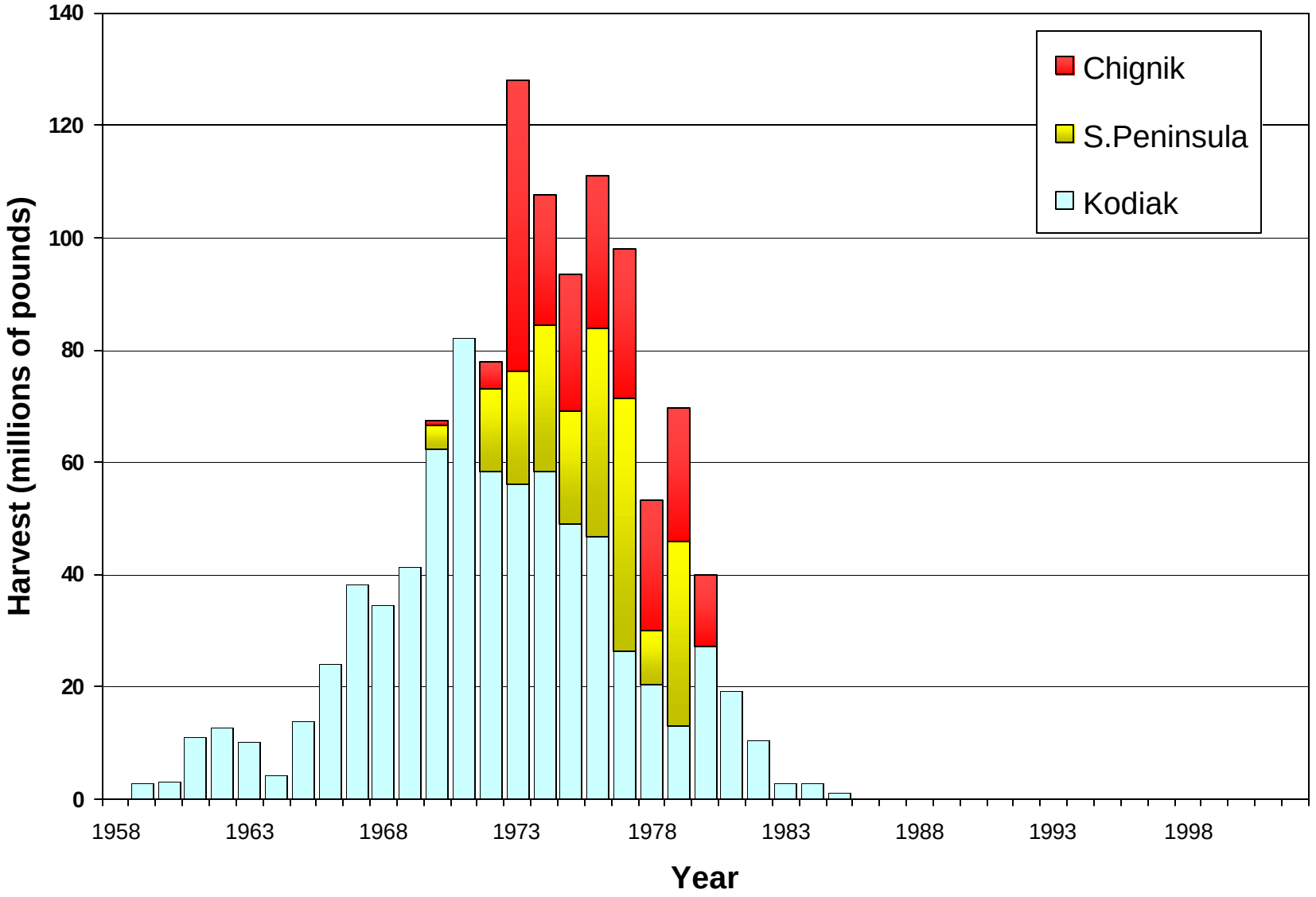

Figure 3. Shrimp harvests from the Kodiak, Chignik, and South Peninsula Districts, 1958-2002.

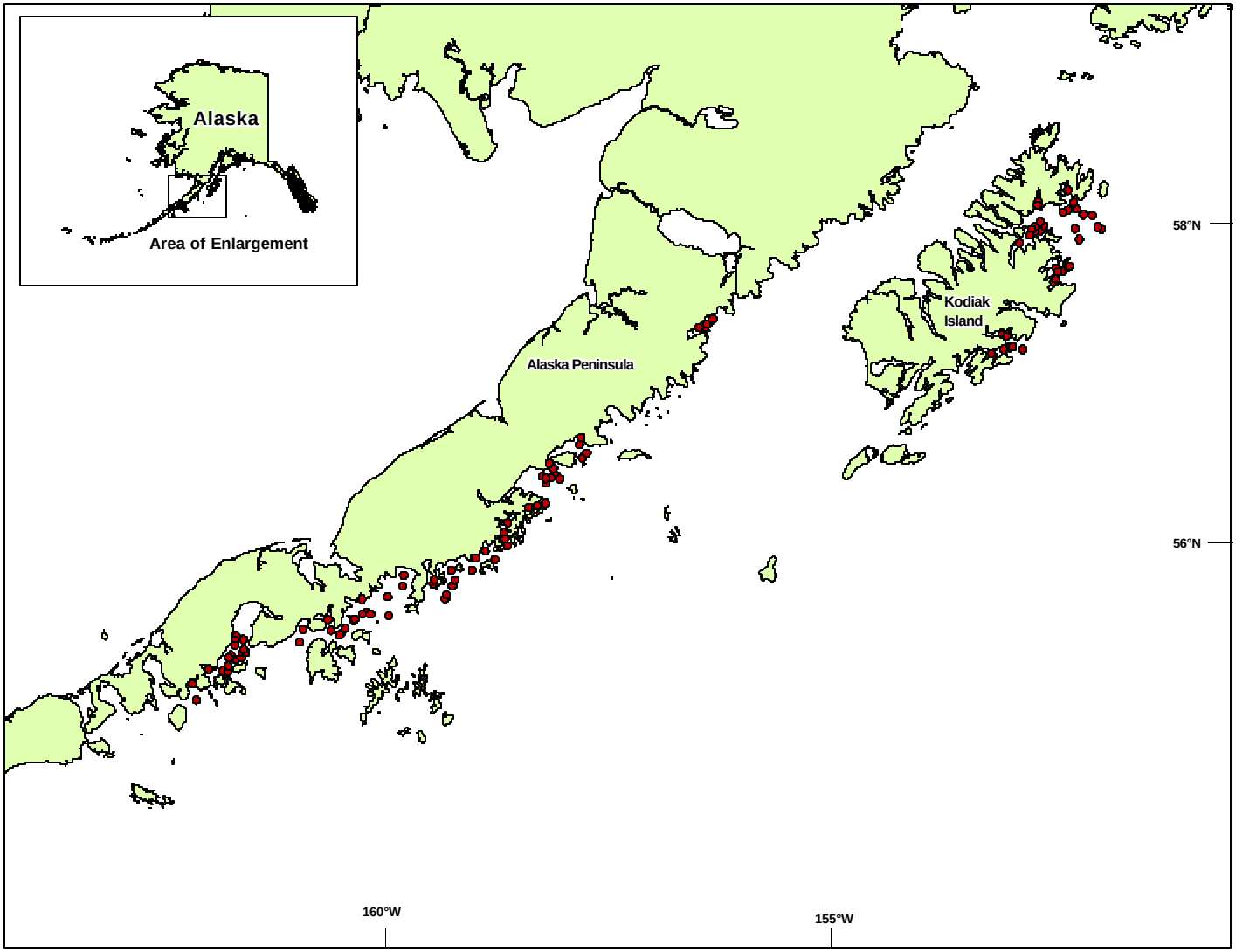

Figure 4. Location of sample sites from the 2002 Westward Region small-mesh trawl survey.

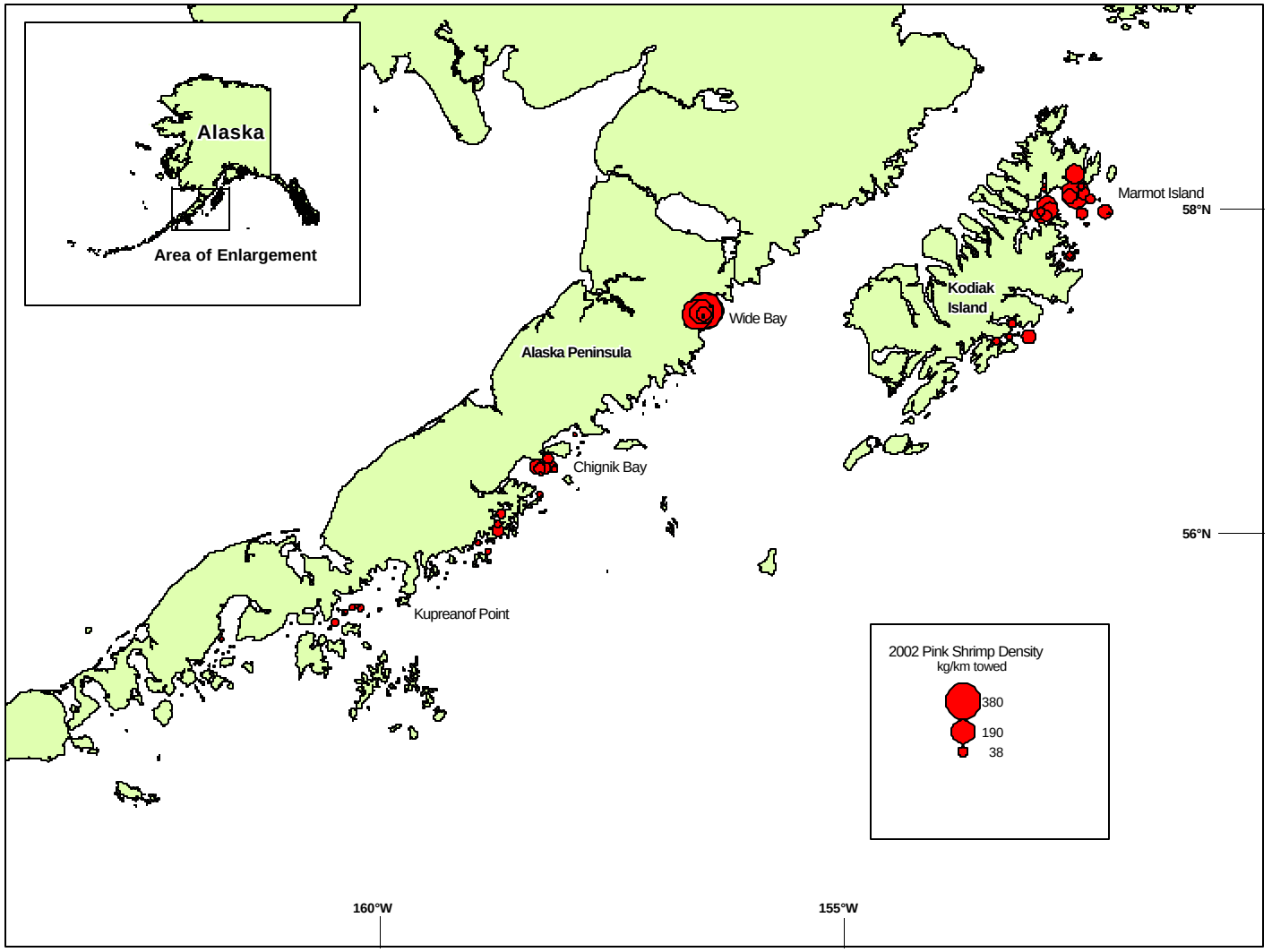

Figure 5. Pink shrimp densities from the 2002 Westward Region small-mesh trawl survey.

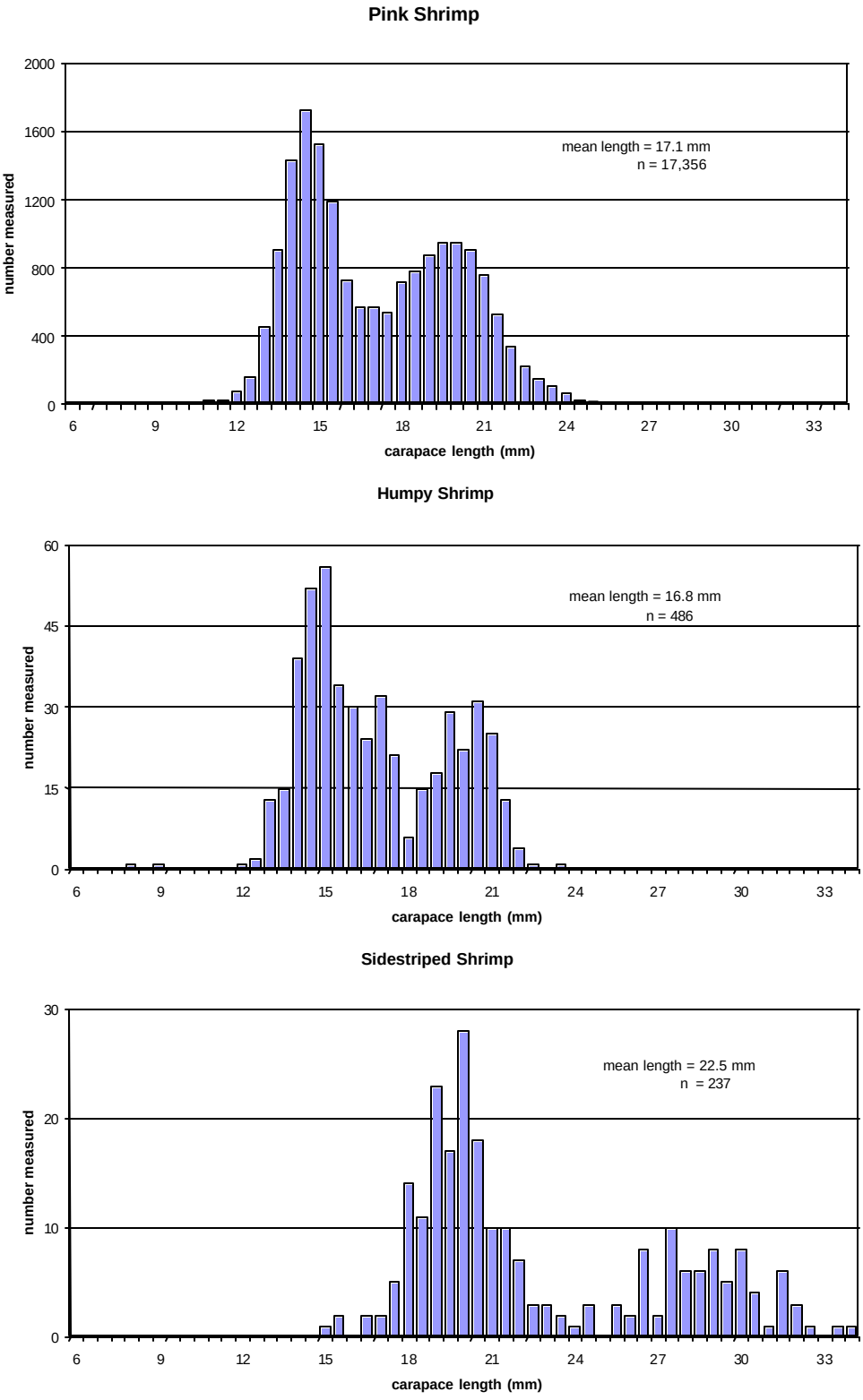

Figure 6. Carapace lengths of pink shrimp, humpy shrimp and sidestriped shrimp from the 2002 Westward Region small-mesh trawl survey.

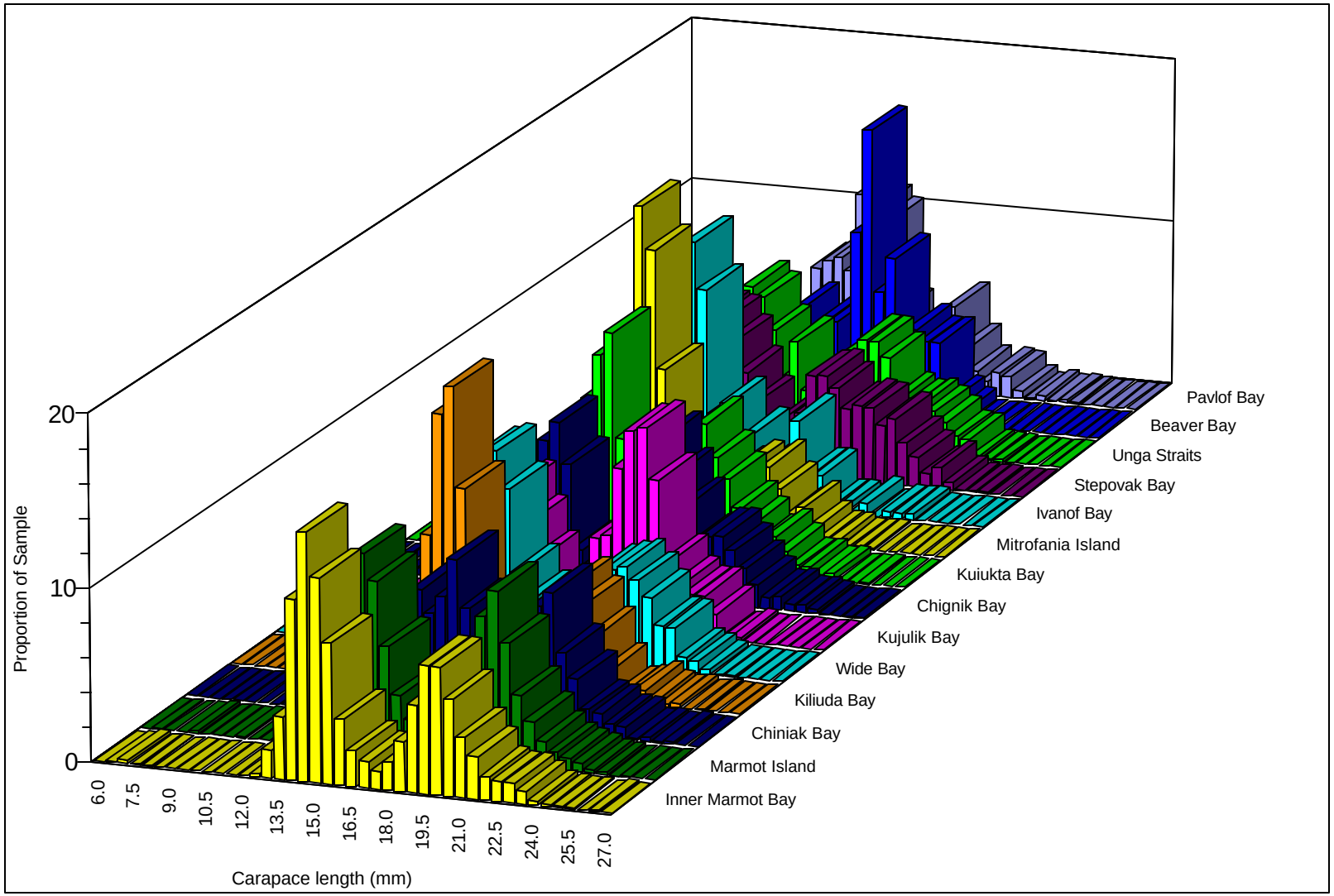

Figure 7. Pink shrimp carapace lengths from the 2002 Westward Region small-mesh trawl survey.

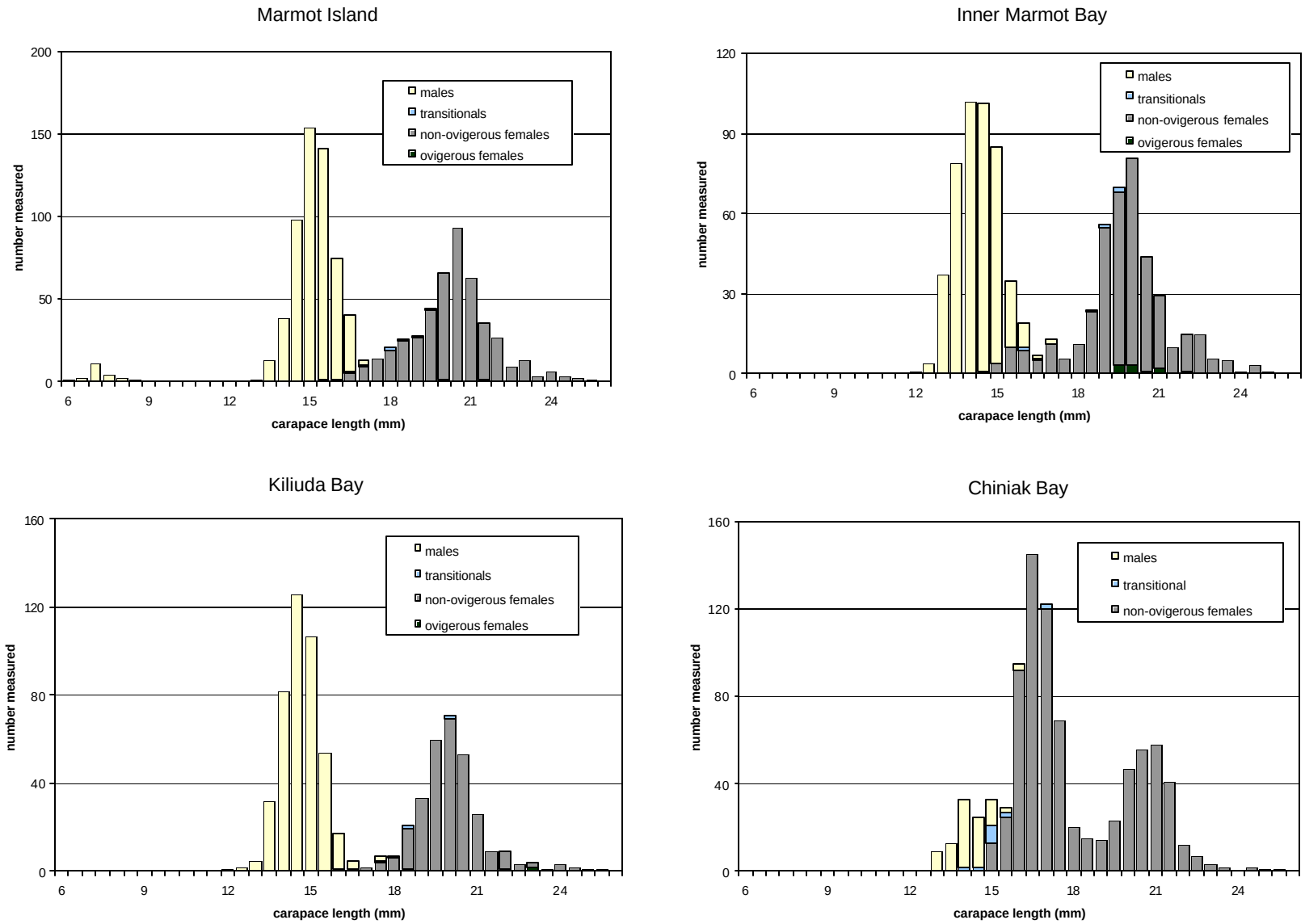

Figure 8. Pink shrimp size composition by sex from the 2002 small-mesh trawl survey of the Marmot Island, Inner Marmot Bay, Kiliuda Bay, and Chiniak Bay commercial fishing sections.

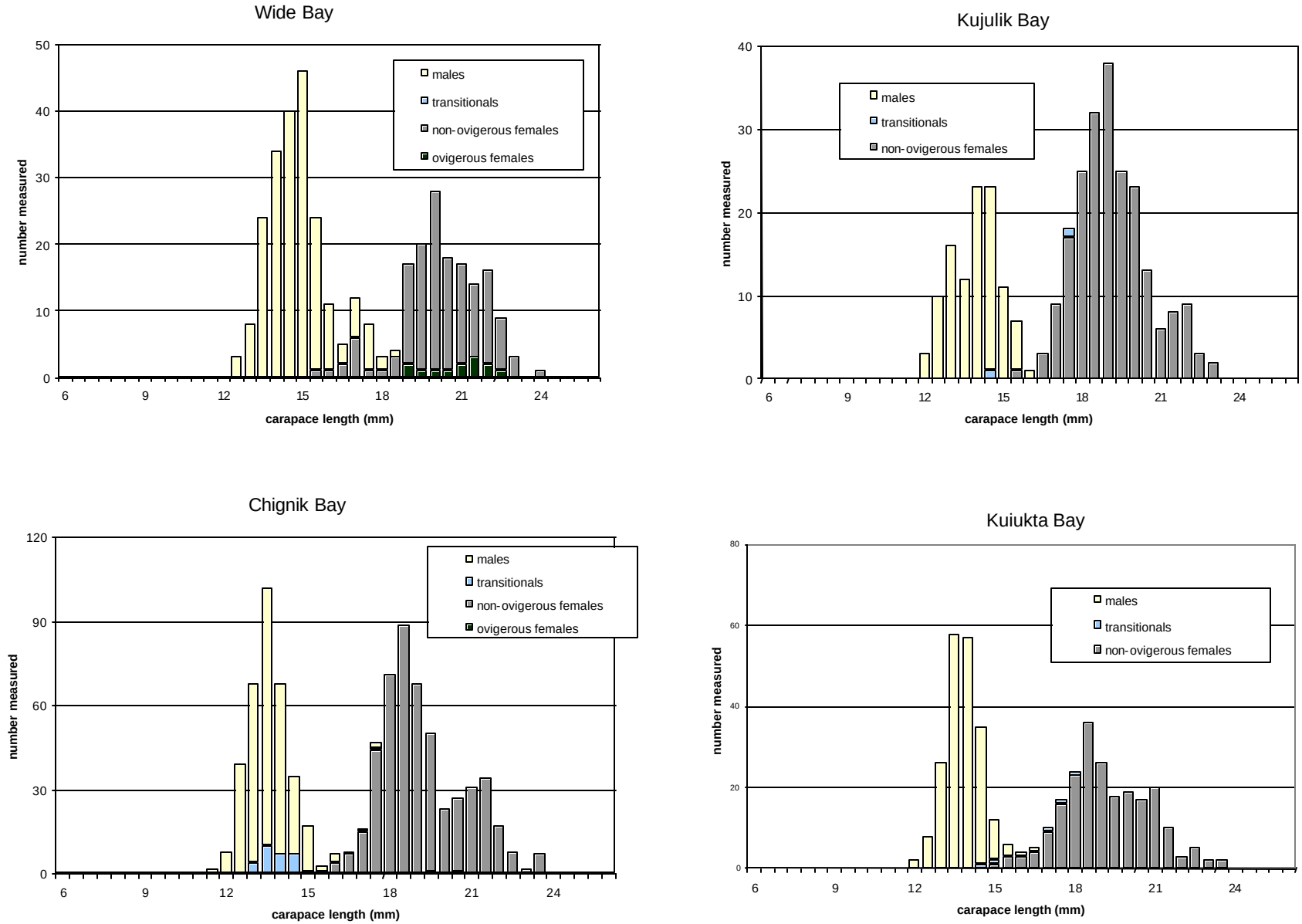

Figure 9. Pink shrimp size composition by sex from the 2002 small-mesh trawl survey of Wide Bay and the Kujulik Bay, Chignik Bay, and Kuiukta Bay commercial fishing sections.

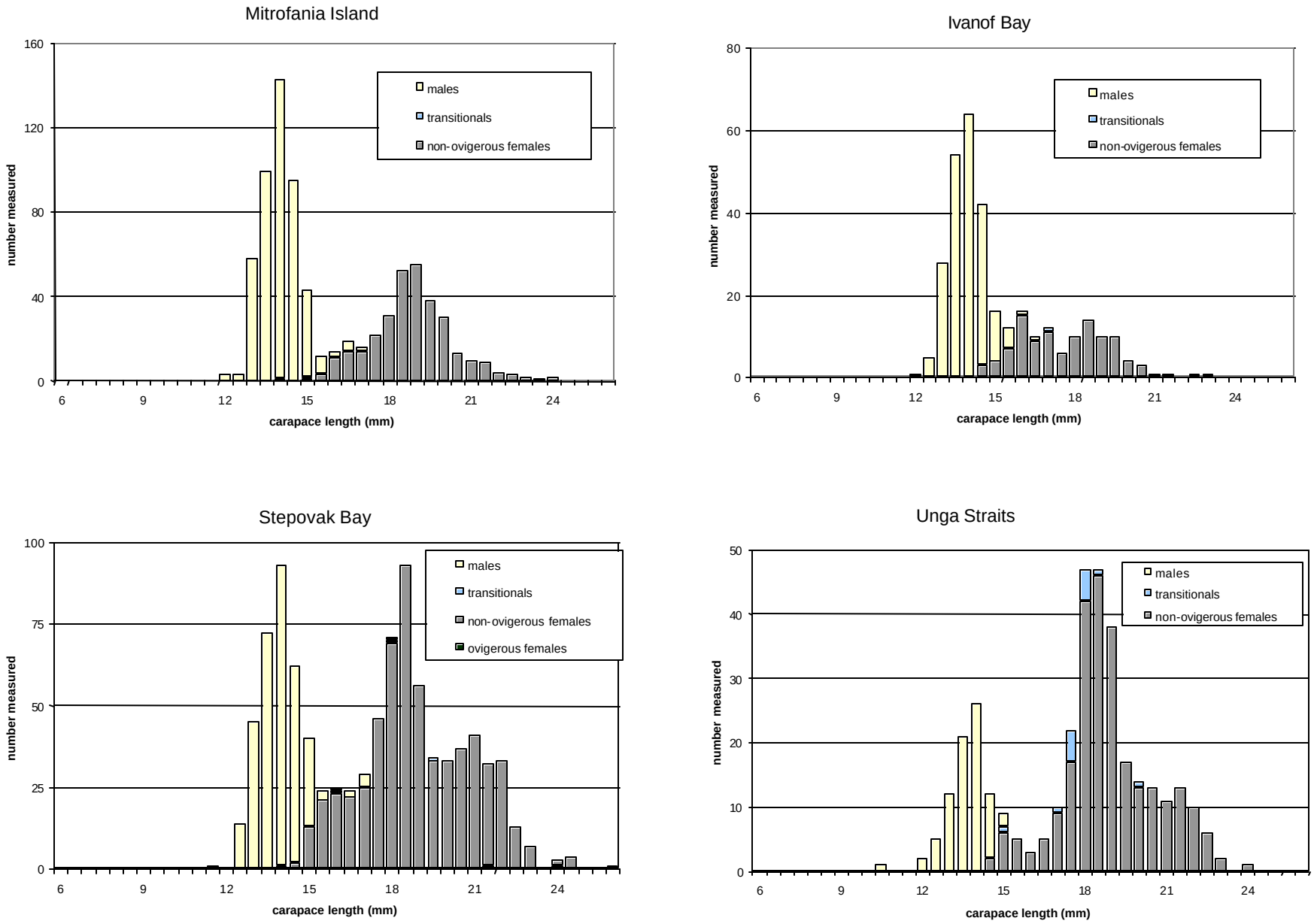

Figure 10. Pink shrimp size composition by sex from the 2002 small-mesh trawl survey of the Mitrofania Island, Ivanof Bay, Stepovak Bay, and Unga Straits commercial fishing sections.

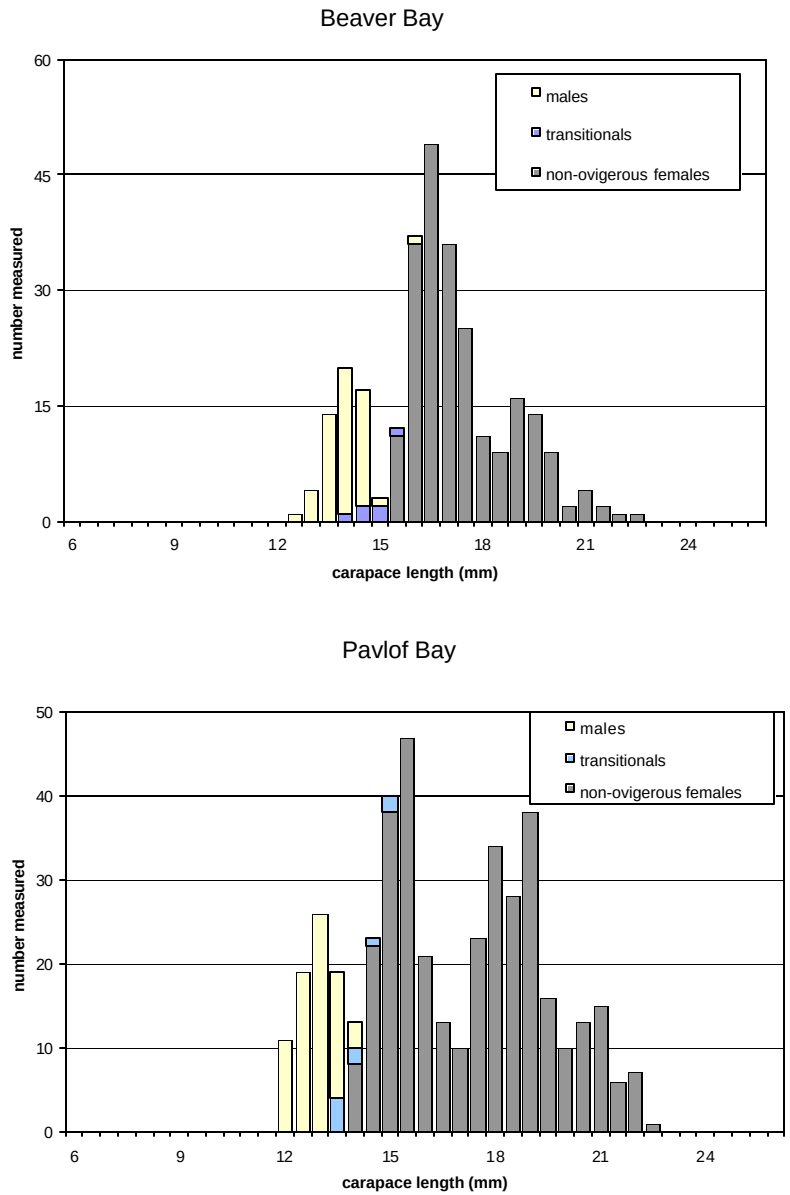

Figure 11. Pink shrimp size composition by sex from the 2002 small-mesh trawl survey of the Beaver Bay and Pavlof Bay commercial fishing sections

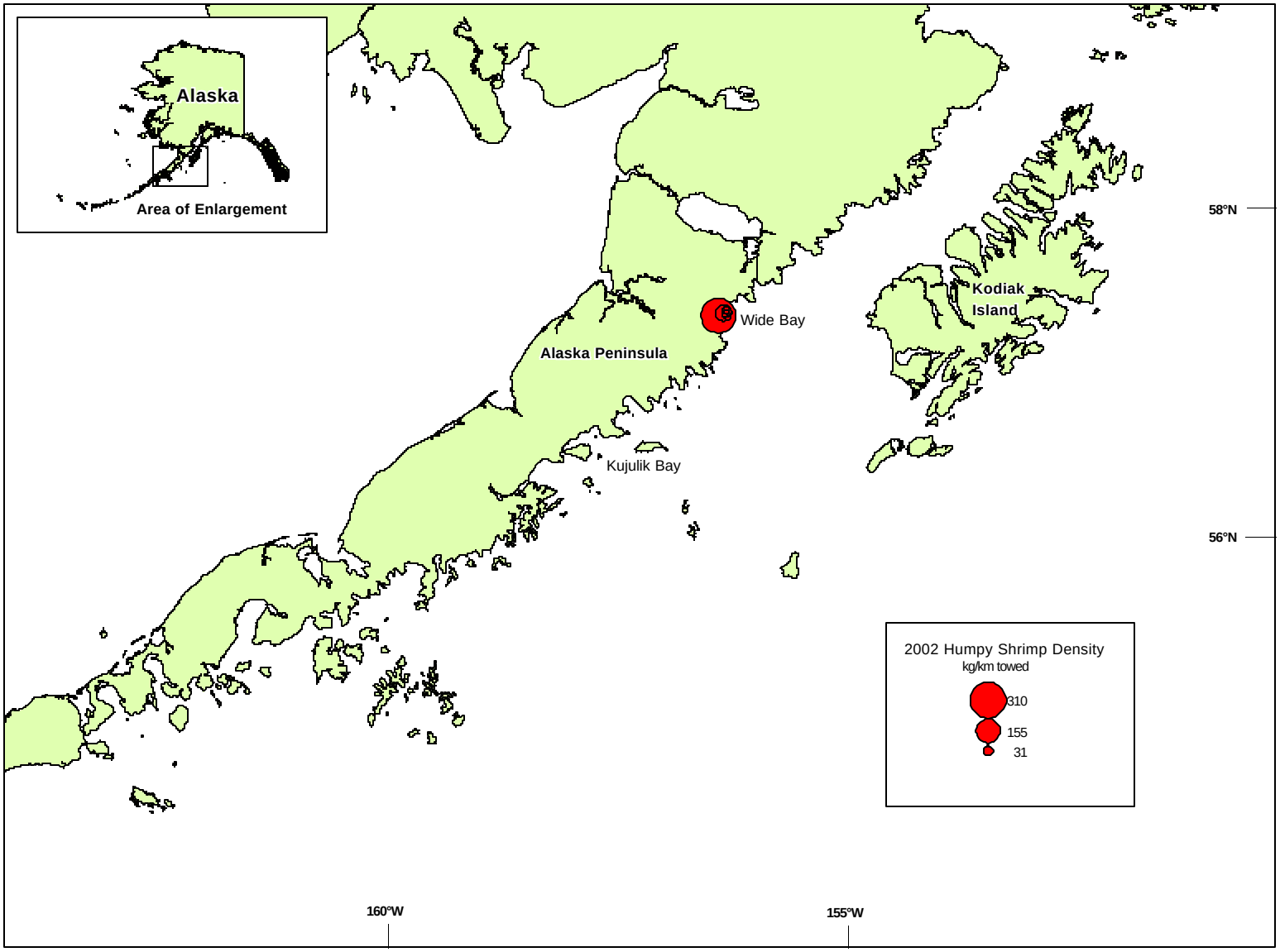

Figure 12. Humpy shrimp densities from the 2002 Westward Region small-mesh trawl survey.

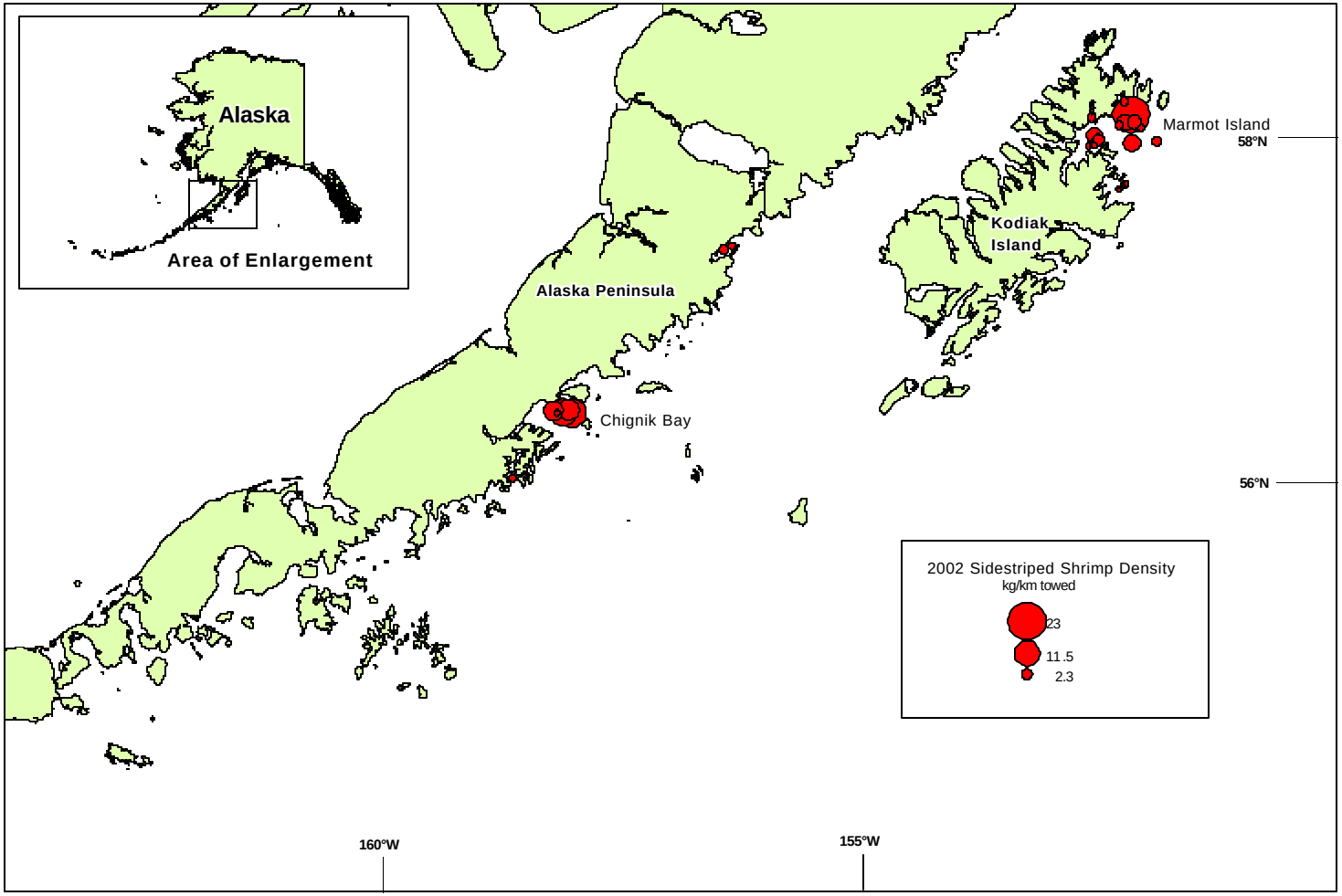

Figure 13. Sidestriped shrimp densities from the 2002 Westward Region small-mesh trawl survey.

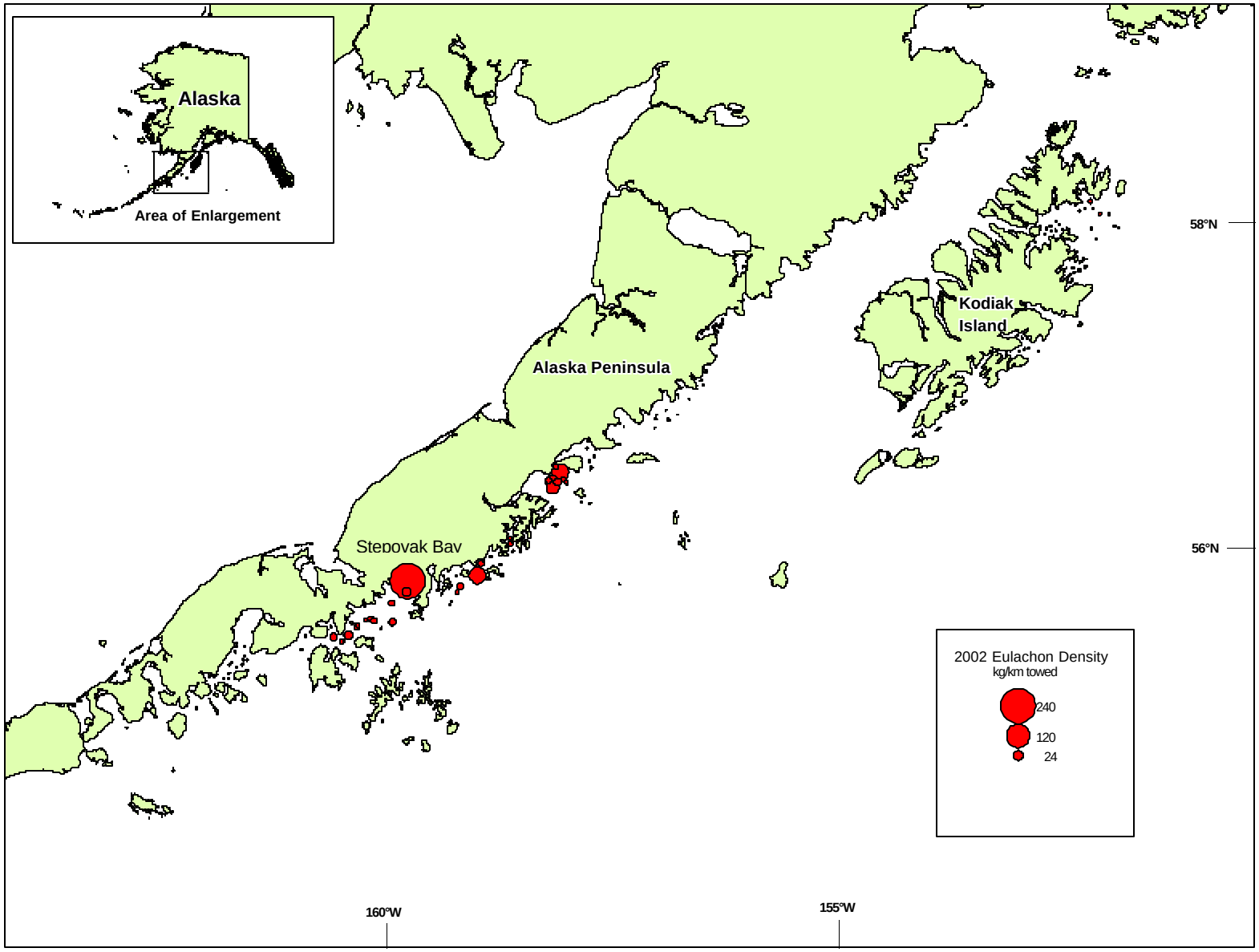

Figure 14. Eulachon densities from the 2002 Westward Region small-mesh trawl survey.

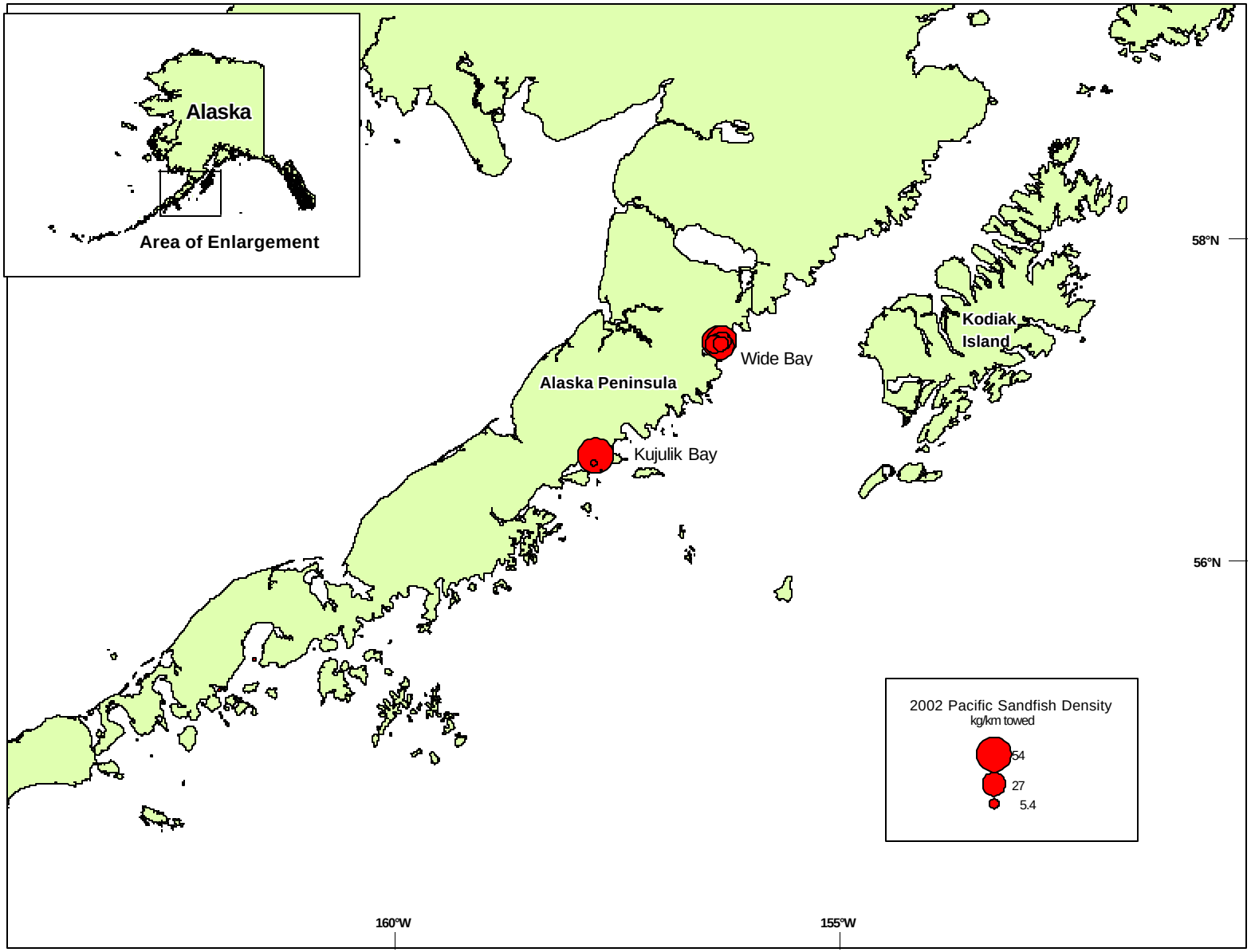

Figure 15. Pacific sandfish densities from the 2002 Westward Region small-mesh trawl survey.

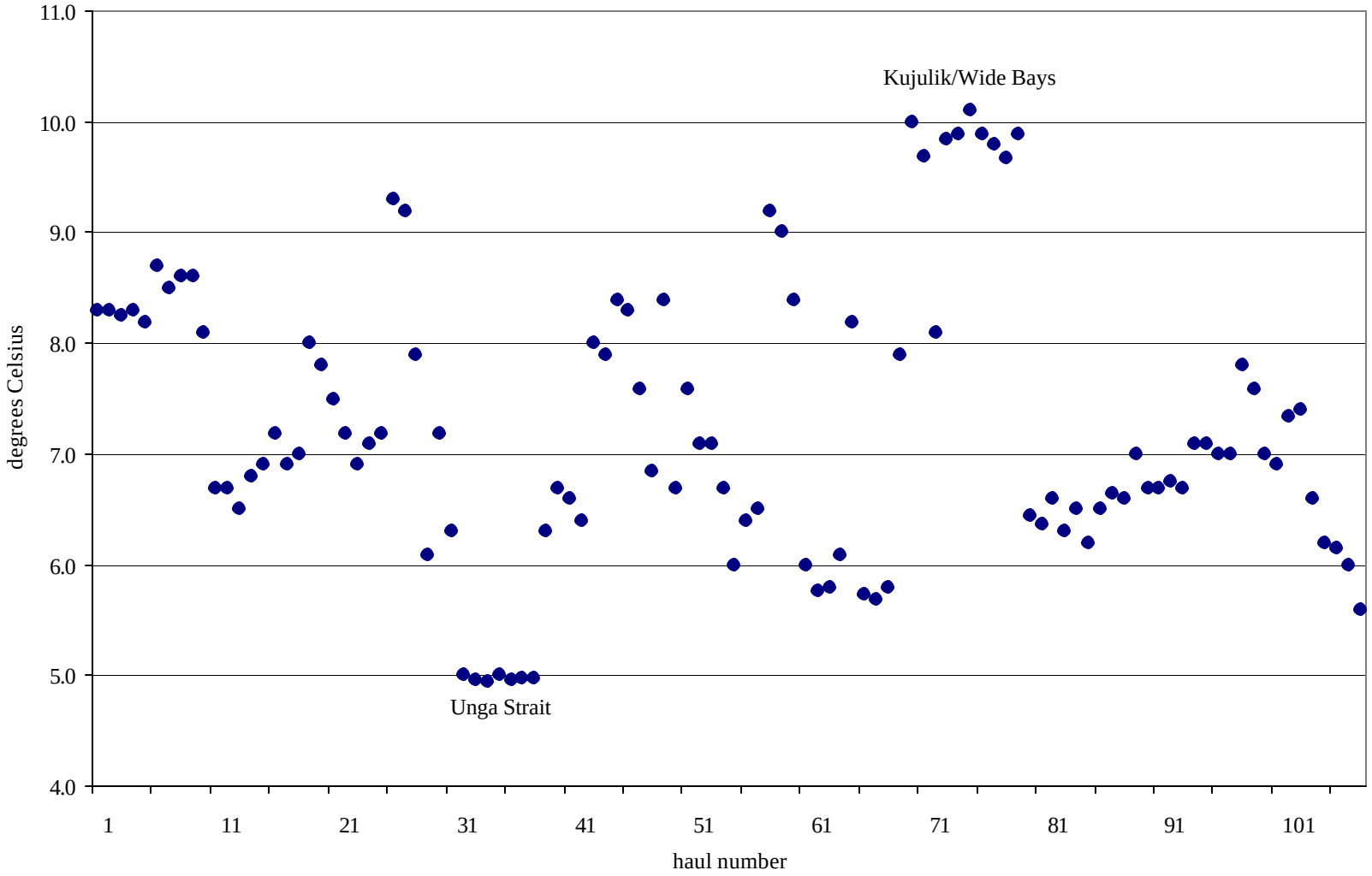

Figure 16. Ocean bottom temperatures from the 2002 Westward Region small-mesh trawl survey.

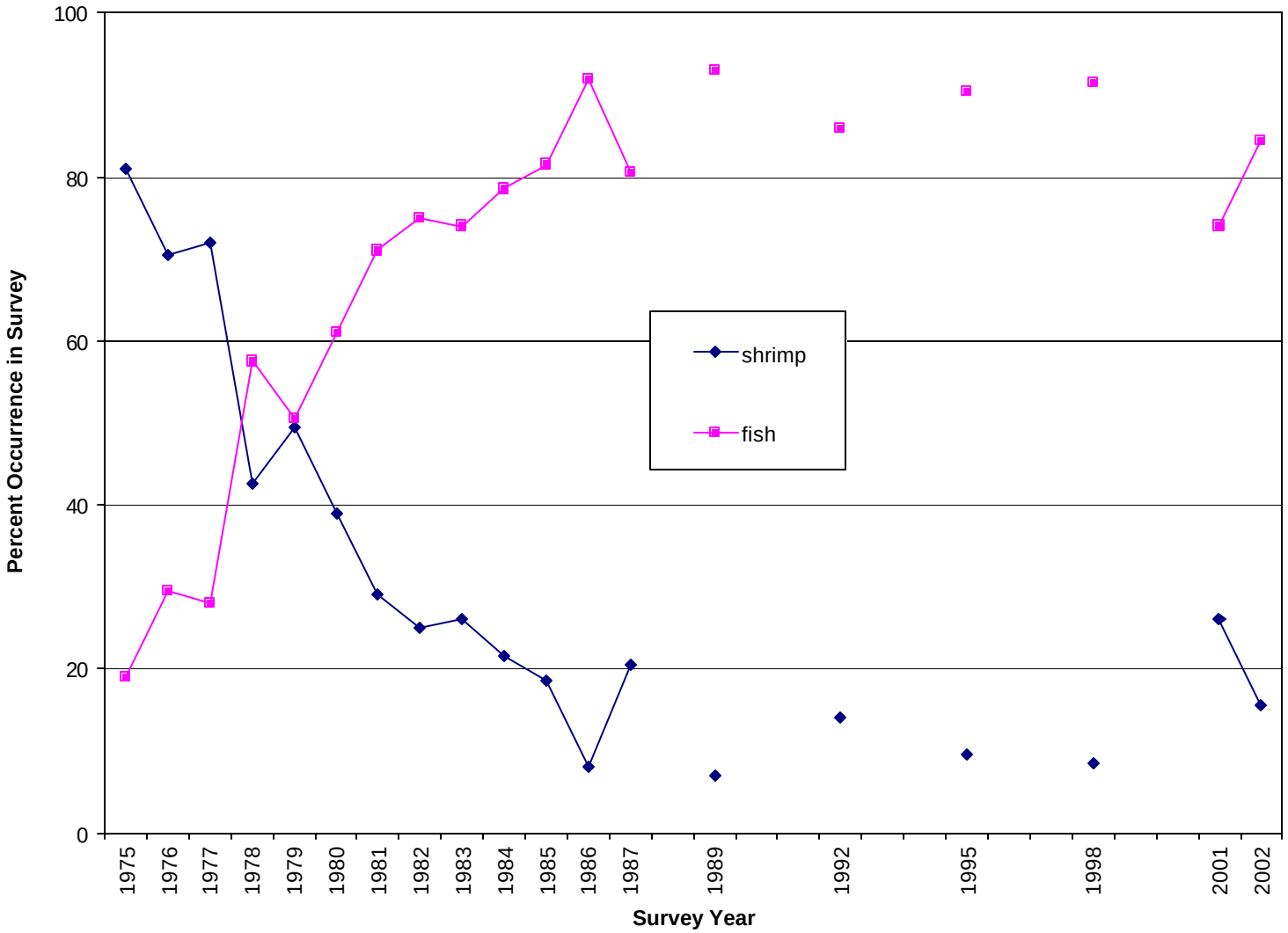

Figure 17. Shrimp and fish catch composition from Westward Region small-mesh trawl surveys, 1975-2002.

APPENDIX

Appendix A. Fishing log and catch data from the 2002 Westward Region small-mesh trawl survey.

Haul	1	2	3	4	5	6	7	8	9	10
Location	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Chiniak	Beaver	Beaver
Month/Day/Year	9/17/02	9/17/02	9/17/02	9/17/02	9/17/02	9/18/02	9/18/02	9/18/02	9/22/02	9/22/02
Station	807	809	808	814	816	801	802	804	177	225
Longitude Start	152 22.4	152 18.1	152 18.1	152 14.5	152 13.8	152 24.4	152 22.9	152 21.3	160 54.0	160 56.5
Latitude Start	57 43.5	57 42.9	57 42.3	57 43.8	57 44.2	57 38.1	57 39.2	57 41.9	55 27.7	55 22.9
Heading, Degrees	139	292	225	55	57	40	37	42	227	0
Average Depth (m)	108	144	144	165	196	68	95	86	84	104
Distance Fished (km)	1.3	1.9	0.9	0.9	1.3	1.5	1.3	0.9	1.9	1.9
Bottom Temperature	8.3	8.3	8.2	8.3	8.1	8.6	8.5	8.6	8.6	8.1
Performance	1	1	1	1	1	1	1	1	1	1
						KILOGRAMS/ KILOMETER				
Pollock	131.8	134.9	141.8	83	34.5	19	88	6.5	401	88.6
Pacific Cod	9.2	33.2	1.4	37	0	4.3	7.8	10	2.8	16
Pacific Sandfish	0.6	0	0.3	0	0	0	0.4	0.4	0.5	0
Eulachon	0	0.5	1.2	0.2	0.3	0.2	3.5	0.1	0	0
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0.1	0.6	0.3	2.1	0	0	0	0	0	0.6
Herring	0.1	0	0	0	0	0.4	0	0.2	0	0
Sculpins	0	0	0.1	0	0	0	1.4	0	0	19
Other Forage Fish	0.2	0.3	0	0	0	0	0	0	0	0
Other Roundfish	0.6	3.4	0	0.1	8.5	0.6	0.2	0	0	39.4
TOTAL ROUNDFISH	142.7	172.9	145.2	122.4	43.2	24.5	101.2	17.3	404.3	163.6
Arrowtooth Flndr	32.2	31.1	26	18.6	13.1	4.3	25.5	13	1.5	12.1
Flathead Sole	30.2	54.9	201.7	123.2	193.5	22.5	59.9	24	3.2	37.2
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	1.3	3.8	2.7	4.2	0	1.2	0	0	0
Dover Sole	1.4	0	0	0	0	0	0	0	0	0
Pac Halibut	1.2	0	0	0	0	0	0	0.7	0	1.8
Starry Flndr	0	0	0	0	0	3.1	23.7	7.5	0	0
Yellowfin Sole	0	0	0	0	0	1.5	0	1.9	0	2
Other Flatfish	92.1	0.9	9	2.1	0	0.4	0.6	7.9	0	2.7
TOTAL FLATFISH	157.1	88.3	240.4	146.6	210.8	31.8	111	55	4.7	55.9
Pink Shrimp	0.6	18.8	35.6	5.8	8.2	0.4	7.4	4.4	0	2.5
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0.2	0	0
Sidestripe	0	0.1	0.9	1.2	0.8	0	0	0	0	0
Other Shrimp	0.1	0	0.2	0	0.4	0.1	0.2	0	0	0
TOTAL SHRIMP	0.7	18.9	36.8	7.1	9.4	0.5	7.6	4.6	0.1	2.6
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	9.3	2.9	86.6	1	0	93.2	34.6	5.6	3.1	0.5
TOTAL INVERTS	9.3	2.9	86.6	1	0	93.2	34.6	5.6	3.1	0.5
Skates	0	0	43.6	0	0	0	0	0	0	10.6
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0.2	0	0.2	0.3	0.3	0	0	0.5	0.2	0
TOTAL CATCH	310	282.9	552.8	277.5	263.8	149.9	254.5	83	412.5	233.2

-Continued-

Haul	11	12	13	14	15	16	17	18	19	20
Location	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof
Month/Day/Year	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02	9/23/02
Station	305	304	294	280	279	263	262	245	205	206
Longitude Start	161 48.6	161 45.2	161 44.8	161 39.6	161 36.1	161 35.2	161 32.9	161 34.6	161 34.8	161 39.7
Latitude Start	55 12.1	55 12.0	55 14.1	55 16.4	55 17.2	55 18.9	55 18.9	55 20.1	55 23.9	55 25.3
Heading, Degrees	90	312	45	57	61	250	69	0	337	194
Average Depth (m)	95	117	115	101	104	97	115	99	82	106
Distance Fished (km)	1.9	1.5	1.3	1.7	1.9	1.9	1.9	1.9	1.5	1.3
Bottom Temperature	6.6	6.6	6.5	6.8	6.9	7.1	6.9	7	8	7.8
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	62.7	41.6	41.7	34.6	14.2	62.2	48.7	55.1	31.4	21.2
Pacific Cod	8.3	1.8	13.7	11.5	2.5	9.9	1.6	0.6	0	9.9
Pacific Sandfish	0	0	0	0	0	0	0	0	0.9	0
Eulachon	0	0	0	0	0	0	0	0	0	0.1
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0.3	0	0	0	0.5	0	0	0	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0	0	0	0	0	0	5.9
Other Forage Fish	0	0	0.9	0	0.1	0	0	0	0	0
Other Roundfish	0.8	1.3	0.4	1.2	1.5	0.4	2.7	0.6	0.5	4.5
TOTAL ROUNDFISH	72	44.6	56.7	47.2	18.9	72.4	53.1	56.2	32.9	41.5
Arrowtooth Flndr	18.1	9.5	42.1	21.8	24	0	30.6	6.4	1.9	25.5
Flathead Sole	62.6	61.6	99.9	45.2	69	32.4	78.3	38.8	22.1	46
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0.6	0	0.7	0.4	0	0	0	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	0.6	0	0	0	3.2	0	4.2	0	0	0
Starry Flndr	0	0	0	0	3.9	0	12.7	0	2.2	0
Yellowfin Sole	6.2	0.8	2.2	30.9	31.8	6.3	6.6	1.9	6.3	39.8
Other Flatfish	3	4.4	0	0	0.4	1.1	0	1	0	13.1
TOTAL FLATFISH	90.4	76.9	144.2	98.6	132.7	39.7	132.4	48.1	32.4	124.4
Pink Shrimp	0	1.5	0.4	0.2	0.2	0.1	0.1	0	0	1
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0	0	0
Sidestripe	0	0	0	0	0	0	0	0	0	0
Other Shrimp	0	0	0	0	0	0	0	0	0	0.3
TOTAL SHRIMP	0.1	1.5	0.5	0.3	0.2	0.1	0.1	0	0	1.2
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	5.9	1	9.9	1.1	1.4	5.4	8.2	2.5	3.2	10.9
TOTAL INVERTS	5.9	1	9.9	1.1	1.4	5.4	8.2	2.5	3.2	10.9
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0	0	0.1	0.4	0	0	0.5	0	0.1	0.8
TOTAL CATCH	168.4	124.1	211.3	147.5	153.3	117.7	194.3	106.9	68.7	178.9

-Continued-

Haul	21	22	23	24	25	26	27	28	29	30
Location	Pavlof	Pavlof	Pavlof	Pavlof	Pavlof	Belkofsk	Belkofsk	Bal/Unga	Bal/Unga	Bal/Unga
Month/Day/Year	9/24/02	9/24/02	9/24/02	9/24/02	9/24/02	9/24/02	9/24/02	9/28/02	9/28/02	9/28/02
Station	227	246	265	282	313	357	329	132	175	173
Longitude Start	161 40.3	161 40.5	161 43.1	161 44.7	161 58.0	162 6.8	162 9.5	160 36.9	160 35.2	160 28.5
Latitude Start	55 23.7	55 21.8	55 18.0	55 17.1	55 12.7	55 1.1	55 7.3	55 31.3	55 27.4	55 26.0
Heading, Degrees	19	180	100	47	125	205	180	180	90	63
Average Depth (m)	110	128	113	110	75	93	79	0	133	132
Distance Fished (km)	1.9	1.9	1.3	1.3	1.9	1.1	1.9	1.7	1.7	0.9
Bottom Temperature	7.5	7.1	6.9	7	7.1	9.3	9.1	7.9	6	7.1
Performance	1	1	1	1	1	1	1	1	1	1
						KILOGRAMS/KILOMETER				
Pollock	7.2	7.3	10.8	36.6	49.5	80.9	244.1	1020.2	281.2	74.6
Pacific Cod	5.3	2.9	5.4	4.9	2.7	1.5	9.2	1.1	9.8	2.7
Pacific Sandfish	0	0	0	0	0.7	0	0.9	0	0	0
Eulachon	0	0	0	0.1	0	0	0	0	18.5	0.4
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0	0	0	0	0	0.1	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0.4	0	0.9	0	0	0	0	4.6	1.2
Other Forage Fish	0	1.7	0	0.1	0.1	0	0	0	0	0
Other Roundfish	1.7	2.5	0.9	2.2	0	2.9	2.2	0	1	0.2
TOTAL ROUNDFISH	14.2	14.8	17.1	44.8	53.1	85.3	256.4	1021.3	315.3	79
Arrowtooth Flndr	36.5	47.8	38	4.4	2	3.4	0	11.2	178.2	44.7
Flathead Sole	51.3	138.3	60.4	20.6	38	128.6	13.1	68.1	132.3	38.9
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0.2	0	0	0	0	3.1	1
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	2.8	11.2	15.9	0	0	0	3.8	0	4.5	0
Starry Flndr	0	0	0	0	6.7	0	11.4	23.5	0	0
Yellowfin Sole	6.7	3.5	11.6	1.6	15.5	5.3	5.8	7.3	8	0
Other Flatfish	13.3	2	12.9	4.2	0	0	9.3	0	5.1	12.3
TOTAL FLATFISH	110.5	202.6	138.8	31	62.2	137.4	43.5	110	331.3	96.9
Pink Shrimp	1.8	11	0.7	0.1	0.1	0.1	0.2	0	1.9	0
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	0	0	0	0	0	0	0	0	0	0
Other Shrimp	0.1	0.4	0.1	0.1	0.1	0	0	0	0.3	0
TOTAL SHRIMP	2	11.4	0.8	0.2	0.2	0.1	0.2	0	2.2	0.1
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	2.5	2.6	1.9	5.6	4.8	8.3	15.9	1.3	2.4	4.2
TOTAL INVERTS	2.5	2.6	1.9	5.6	4.8	8.3	15.9	1.3	2.4	4.2
Skates	8.6	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0.4	0.7	0.2	0	0.7	1.1	0.4	0	2.7	1.2
TOTAL CATCH	138.2	232.1	158.9	81.7	120.9	232.1	316.4	1132.7	653.9	181.3

-Continued-

Haul	31	32	33	34	35	36	37	38	39	40
Location	Bal/ Unga	Bal/ Unga	Bal/Unga	Bal/Unga	Stepovak	Stepovak	Stepovak	Stepovak	Stepovak	Stepovak
Month/Day/Year	9/28/02	9/28/02	9/28/02	9/28/02	9/29/02	9/29/02	9/29/02	9/29/02	9/29/02	9/29/02
Station	199	151	131	130	111	90	109	106	51	11
Longitude Start	160 29.5	160 25.3	160 19.7	160 19.0	160 13.7	160 10.5	160 8.4	159 56.0	159 56.6	159 45.9
Latitude Start	55 25.8	55 28.0	55 31.2	55 31.6	55 33.5	55 34.0	55 33.3	55 32.8	55 39.9	55 48.1
Heading, Degrees	90	33	225	69	133	85	90	265	0	0
Average Depth (m)	132	168	170	176	183	179	174	177	117	115
Distance Fished (km)	1.1	0.9	0.9	1.1	2.4	1.7	1.3	1.3	1.3	1.1
Bottom Temperature	6.3	5	4.9	4.9	5	4.9	4.9	4.9	6.3	6.6
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	197.6	78.3	54.1	42.4	18.1	38.2	18.6	14.4	8.9	23.5
Pacific Cod	2.7	11.6	11.7	9.4	5.1	3.8	8.8	1.5	2.6	0
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	7.4	20.8	11.6	4.3	3.3	12	9.7	12.8	9.3	236.4
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0.6	0	0	0.5	0.5	1	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0	0	0	1	0	0	0
Other Forage Fish	0	0.2	0	0	0	0	0.4	0	0	0
Other Roundfish	0	0.5	0.1	0	2	6.8	0.8	0.6	1.1	0
TOTAL ROUNDFISH	207.7	111.4	78.2	56.1	28.7	61.1	39.7	30.4	21.9	259.9
Arrowtooth Flndr	33.1	47.1	44.2	128.3	24.8	32.9	56	56	0.4	11.4
Flathead Sole	52.5	44.8	43.2	83.4	36.1	50.2	47.3	31.6	3.9	1.3
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.5	0	1.7	4.2	2.5	2.7	4.8	1.2	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	0	0	1.7	22.5	0	15.2	0	0	0	0
Starry Flndr	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	86.1	92	90.7	238.4	63.5	101	108.2	88.9	4.3	12.7
Pink Shrimp	0.4	28.9	5.3	14.7	16	6.7	19.2	9.7	0.2	0
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	0	0	0	0	0	0.2	0	0.2	0	0
Other Shrimp	0	0	0.1	0.1	0.1	0.1	0.1	0.5	0	0
TOTAL SHRIMP	0.4	29	5.3	14.7	16	7	19.4	10.4	0.2	0
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	2.7	26.4	47.8	58.5	9.2	10.4	14.4	13.8	2.1	6.1
TOTAL INVERTS	2.7	26.4	47.8	58.5	9.2	10.4	14.4	13.8	2.1	6.1
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0	0.4	0.3	3	1.3	0.4	0.4	1.5	0	0.2
TOTAL CATCH	296.9	259.1	222.4	370.7	118.7	179.9	182	145	28.5	279

-Continued-

Haul	41	42	43	44	45	46	47	48	49	50
Location	Stepovak	Stepovak	Ivanof	Ivanof	Ivanof	Ivanof	Ivanof	Ivanof	Ivanof	Mitrofan
Month/Day/Year	9/29/02	9/29/02	9/30/02	9/30/02	9/30/02	9/30/02	9/30/02	9/30/02	9/30/02	9/30/02
Station	36	61	1998	35	58	45	25	16	10	5
Longitude Start	159 46.5	159 74.3	159 25.2	159 25.6	159 17.4	159 16.6	159 12.8	159 10.8	159 13.5	158 59.3
Latitude Start	55 44.0	55 39.1	55 46.3	55 44.7	55 39.2	55 40.6	55 44.0	55 46.2	55 50.0	55 50.0
Heading, Degrees	202	16	249	169	220	90	0	345	190	11
Average Depth (m)	126	123	86	99	102	106	99	102	80	123
Distance Fished (km)	0.9	1.3	1.3	1.3	1.3	0.7	1.3	1.3	1.1	1.3
Bottom Temperature	6.5	6.4	8	7.9	8.3	8.3	7.5	6.8	8.3	6.6
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	25.6	1.9	88.2	55.9	1.2	3.8	11.3	1.8	599.4	1.6
Pacific Cod	0	0.4	2.3	5	0	0	0	0	3.1	0
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	19.2	2.9	0.1	2.4	0.3	0.5	4.7	14.3	0	64.4
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0.9	0	0	0	1.4	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0	0	0	0	0	0	0
Other Forage Fish	0	0	0	0	0	0	0	0	0	0
Other Roundfish	0	0	0	0	0	0	1	0.4	0	0
TOTAL ROUNDFISH	44.9	5.2	90.5	64.3	1.5	4.3	17	18	602.5	66
Arrowtooth Flndr	2.2	18.1	1.4	8.3	1.1	3.1	5.9	19.3	0	20.8
Flathead Sole	17.5	9.3	11.5	19.3	2.3	1.8	2.8	7.7	8.4	16.4
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.2	0.8	0.3	0.3	0	0	0	0	0	0.2
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	0	4.8	0	0	0	0	0	0	0	0
Starry Flndr	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0.9	0	0	0	0	0	0
Other Flatfish	0	0	5.9	3.8	0	0	0	0	0	0
TOTAL FLATFISH	19.8	33.1	19.1	32.6	3.4	4.9	8.7	27	8.4	37.4
Pink Shrimp	0.3	0.6	0.1	0.2	0	0	0	1.2	0	1.4
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	0	0	0	0	0	0	0	0	0	0
Other Shrimp	0.1	0	0	0	0	0	0	0	0	0.1
TOTAL SHRIMP	0.4	0.6	0.1	0.2	0	0	0	1.2	0	1.5
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	3.1	8.9	16.4	3.1	1.8	0.9	0.7	2.3	3.7	6.1
TOTAL INVERTS	3.1	8.9	16.4	3.1	1.8	0.9	0.7	2.3	3.7	6.1
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	0	0	0	0	0	0	0
Other	0	0.2	1.9	0.1	0.2	0.1	0	0.1	0.9	0
TOTAL CATCH	68.2	48	128	100.2	6.9	10.2	26.5	48.6	615.5	111

-Continued-

Haul	51	52	53	54	55	56	57	58	59	60
Location	Mitrofan	Mitrofan	Mitrofan	Kuiukta	Kuiukta	Kuiukta	Kuiukta	Chignik	Chignik	Chignik
Month/Day/Year	9/30/02	10/1/02	10/1/02	10/1/02	10/1/02	10/1/02	10/1/02	10/2/02	10/2/02	10/2/02
Station	1	1097	1972	1090	1970	1061	1082	1900	1902	1909
Longitude Start	158 56.9	158 50.4	158 44.0	158 35.6	158 35.0	158 37.5	158 37.3	158 20.7	158 15.3	158 9.7
Latitude Start	55 54.5	55 57.0	55 54.0	55 59.0	56 7.9	56 4.0	56 1.7	56 13.5	56 14.3	56 15.2
Heading, Degrees	243	112	120	349	222	187	150	90	50	69
Average Depth (m)	99	141	139	119	155	165	168	73	77	119
Distance Fished (km)	0.9	1.3	1.9	1.3	1.5	0.9	1.3	1.9	1.5	1.9
Bottom Temperature	7.5	7	7	6.6	6	6.4	6.5	9.1	9	8.3
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	89.6	10.1	1.4	2.8	36.9	5.5	27.1	87.8	52.6	41.8
Pacific Cod	0	0	0	2.5	10.1	19.3	11.3	7.1	0	8.9
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	10	1.7	1.9	0.4	0.5	5.8	7	0	0	0.1
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0	0.5	0	0	0	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0	0	0.1	0	0	0	0	0	0
Other Forage Fish	0	0	0	0	3.4	1	2.1	0	0	0
Other Roundfish	0	0.4	0.1	0.4	0.1	0.2	2.2	0.1	0	0
TOTAL ROUNDFISH	99.5	12.3	3.4	6.1	51.5	31.8	49.7	95	52.6	50.8
Arrowtooth Flndr	14.9	32.4	7.1	1.1	26.9	33.6	21.7	0.9	0.8	10.9
Flathead Sole	8.6	25	30	4.5	98.7	36.2	92	43.8	3.7	47.1
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.1	1.3	0.4	0.6	0.9	1.6	3.7	0	0	0
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	0	0	0	0	0	0	0	0	1.6	8.3
Starry Flndr	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	2.3	0	0	1.3	2.3	0
Other Flatfish	0	0	0	0	0	0	0	2.9	0	0
TOTAL FLATFISH	23.6	58.8	37.5	6.2	128.8	71.5	117.4	48.9	8.4	66.3
Pink Shrimp	0.1	15	14.6	1.3	35.8	23.4	54.9	0.7	0.2	16.7
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	0	0	0	0	0	0.1	1.4	0	0	0
Other Shrimp	0	0.3	0.5	0.1	0.1	0.1	0.2	0	0	0.2
TOTAL SHRIMP	0.1	15.3	15.2	1.4	35.9	23.5	56.5	0.7	0.2	16.8
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	0.3	1.3	0.3	1.1	2.8	8.4	4.5	29.8	33.1	2.4
TOTAL INVERTS	0.3	1.3	0.3	1.1	2.8	8.4	4.5	29.8	33.1	2.4
Skates	0	0	0	0	0	15	0	0	0	2.8
Spiny Dogfish	0	1.9	0	0	0	0	0	0	0	8.5
Other	0	0.7	0.2	0.3	1	0.9	0.2	0.5	0.2	0.3
TOTAL CATCH	123.6	90.2	56.5	15.2	220	151.1	228.3	174.9	94.5	147.9

-Continued-

Appendix A. (page 7 of 11)

Haul	61	62	63	64	65	66	67	68	69	70
Location	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Chignik	Kujulik	Kujulik
Month/Day/Year	10/2/02	10/2/02	10/2/02	10/2/02	10/2/02	10/2/02	10/3/02	10/3/02	10/3/02	10/3/02
Station	1910	1917	1931	1938	1941	1920	1926	1922	1944	1964
Longitude Start	158 9.2	157 59.9	158 2.0	158 4.0	158 7.0	158 5.7	158 11.6	158 9.4	157 44.6	157 45.1
Latitude Start	56 22.5	56 24.3	56 25.6	56 28.2	56 30.3	56 24.6	56 25.2	56 24.4	56 32.2	56 39.7
Heading, Degrees	53	89	115	147	127	90	90	90	70	180
Average Depth (m)	135	188	183	137	91	196	155	154	91	40
Distance Fished (km)	1.3	0.9	1.3	1.1	1.3	1.1	1.3	1.3	1.1	1.1
Bottom Temperature	6	5.7	5.8	6	8.1	5.7	5.6	5.8	7.9	10
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	87.5	58.9	54.8	143.3	115.9	93.8	213.3	79.1	4.5	5.9
Pacific Cod	11.7	7.3	0	3.1	22	6	37.8	23	0	2.4
Pacific Sandfish	0	0	0	0	0	0	0	0.3	0	53.3
Eulachon	41.1	4.5	7.8	61.7	7.6	16.3	9.4	48.1	2.3	0
Capelin	0.4	0	0	0	0	0	0	0	0	0
Rockfish	0	0	1.2	0	0	0	0	0.2	0	0
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0	0.1	0	0	0	1.1	1.9	2	0	0
Other Forage Fish	0	0	0.1	0	0	1.2	0	0.6	0	0
Other Roundfish	0	0	4.9	0.2	0	2.7	0.4	0.6	0	0.5
TOTAL ROUNDFISH	140.8	70.7	68.9	208.4	145.5	121.1	262.8	153.9	6.8	62.1
Arrowtooth Flndr	14.5	24.9	30.6	69.7	13	37.7	64.1	53.3	9.9	0.1
Flathead Sole	20.4	36.6	50.6	28	6.2	51	75.3	77.9	18.3	8.5
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0.6	0	1.2	0	0.9	5.5	1.3	1.8	0	0
Dover Sole	0	0	1.1	0	0	0	0	0	0	0
Pac Halibut	0	0	0	0	0	0	0	2.4	1.1	0
Starry Flndr	0	0	0	0	0	0	0	0	2.2	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	9.1
Other Flatfish	0	0	0	0.5	0	0	0	0	0	0
TOTAL FLATFISH	35.5	61.4	83.5	98.2	20.1	94.2	140.8	135.3	31.5	17.7
Pink Shrimp	9.9	21.9	46.4	40.7	0.6	44.7	71.4	49.2	2.1	0
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	0	14.2	7.9	0	0	13.3	6.5	1.1	0	0
Other Shrimp	0.1	0.3	0.5	0.2	0	0	0.1	0.3	0.1	0
TOTAL SHRIMP	9.9	36.4	54.8	40.8	0.7	58	78	50.5	2.2	0
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	3.4	14.5	2.9	3.3	47.9	11.9	8	10.3	11.6	8.3
TOTAL INVERTS	3.4	14.5	2.9	3.3	47.9	11.9	8	10.3	11.6	8.3
Skates	0	0	0	0	0	0	0	0	0	0
Spiny Dogfish	0	0	0	5.4	0	2.8	0	0	0	0
Other	0.1	0.4	2.7	0.3	0.1	0	4	0	0.2	0.2
TOTAL CATCH	189.7	183.5	212.8	356.3	214.4	287.9	493.6	350.1	52.3	88.4

-Continued-

Haul	71	72	73	74	75	76	77	78	79	80
Location	Kujulik	Kujulik	Wide Bay	Wide Bay	Wide Bay	Wide Bay	Wide Bay	Wide Bay	Wide Bay	Marmot I
Month/Day/Year	10/3/02	10/3/02	10/4/02	10/4/02	10/4/02	10/5/02	10/5/02	10/5/02	10/5/02	10/10/02
Station	1961	1953	746	742	740	743	745	747	741	110
Longitude Start	157 46.2	157 41.4	156 20.0	156 22.0	156 21.1	156 20.9	156 19.8	156 15.8	156 25.2	152 6.9
Latitude Start	56 37.0	56 34.0	57 22.5	57 21.9	57 20.4	57 21.2	57 22.4	57 24.2	57 21.1	57 54.2
Heading, Degrees	150	146	220	240	229	0	0	77	60	314
Average Depth (m)	73	86	64	55	42	59	66	60	0	126
Distance Fished (km)	1.1	1.1	1.9	1.9	0.9	1.3	0.6	0.6	1.9	0.9
Bottom Temperature	9.6	8.1	9.8	9.8	10.1	9.8	9.8	9.6	9.8	6.4
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	10.9	38.9	49.4	33.6	2.9	79.6	37.6	31.9	16	52.8
Pacific Cod	0	3.3	0	0	0	0	0	0	0	2.3
Pacific Sandfish	2.6	0	39.4	49.4	32	12	15.7	0.1	15.9	0
Eulachon	0	2.2	0	0	0	0	0	0	0	0
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0	0	0	0	0	0	0	0	0
Herring	0	0	3.7	1.4	0.6	1.2	0.4	0.3	1	0
Sculpins	0	0	6.8	23.4	0	1.2	0	0.1	28.4	0.5
Other Forage Fish	0	0	0	0.3	0	0	0.1	0	0.3	0
Other Roundfish	0	0.1	4.4	14.8	2.3	3.6	1.8	1.8	3	1.6
TOTAL ROUNDFISH	13.6	44.6	103.7	122.9	37.8	97.7	55.7	34.2	64.6	57.1
Arrowtooth Flndr	0	2.2	0.4	0.3	0	0	0	0.3	0	82.1
Flathead Sole	24.1	5.1	8	6.4	1.2	0	6	0.5	6.1	6.7
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0	0	0	0	0	0	0	0	1.3
Dover Sole	0	0	0	0	0	0	0	0.1	0	1.9
Pac Halibut	0	0	0.4	0.8	0.6	1.1	0	0.1	18.7	0
Starry Flndr	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	1.3	2.4	6.7	1.6	0	3	0.8	4.4	0
Other Flatfish	0	0	0	0	0	4.3	0	1.2	0	0
TOTAL FLATFISH	24.2	8.7	11.2	14.2	3.4	5.4	9	3	29.2	92.1
Pink Shrimp	5.6	0.1	373.3	185.1	5.9	73.5	364	0.3	282.1	8.1
Humpy Shrimp	0	0	34.5	76.7	0.1	10.2	10.5	0	301.8	0
Coonstriped	0	0	9.5	0	0.6	39.5	2.2	0	67.5	0
Sidestriped	0	0	1.4	0	0	0	0	0	2.2	0
Other Shrimp	0.4	0	0.9	0.2	1.9	0	0	0	6.7	0.1
TOTAL SHRIMP	6	0.1	419.6	262	8.5	123.2	376.8	0.3	660.4	8.2
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	436.8	34.4	6.8	0.3	4.6	0	0	8.9	0.1	0.1
TOTAL INVERTS	436.8	34.4	6.8	0.3	4.6	0	0	8.9	0.1	0.1
Skates	0	0	0	0	0	0	0	0	6.9	0
Spiny Dogfish	2.9	0	0	3.4	0	0	0	0	10.9	0
Other	1.5	0.1	0.8	0	0	0.5	1.2	1.8	0	0.1
TOTAL CATCH	485	87.9	542.1	402.8	54.3	226.8	442.7	48.2	772.1	157.6

-Continued-

Haul	81	82	83	84	85	86	87	88	89	90
Location	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I	Marmot I
Month/Day/Year	10/10/02	10/10/02	10/10/02	10/11/02	10/11/02	10/11/02	10/11/02	10/11/02	10/11/02	10/12/02
Station	103	29	19	9	2	522	480	496	490	478
Longitude Start	152 10.0	151 52.1	151 54.6	151 58.3	152 4.3	152 8.6	1521381	152 10.7	152 14.9	152 14.4
Latitude Start	57 58.2	57 58.1	57 58.8	58 3.3	58 3.5	58 5.5	58 6.4	58 8.1	58 12.7	58 5.4
Heading, Degrees	146	287	307	270	333	345	48	310	160	220
Average Depth (m)	176	146	168	126	148	219	176	172	130	170
Distance Fished (km)	1.1	0.9	0.9	1.1	1.1	0.9	1.3	1.7	0.9	1.1
Bottom Temperature	6.3	6.5	6.3	6.5	6.1	6.5	6.6	6.5	7	6.6
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	21	70.8	9.6	0	3.5	56.5	46.6	338.8	4.4	22
Pacific Cod	2.6	3	30.7	0	1.7	55.3	12.6	66.9	153	7.7
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	2.7	0	0.2	2.9	2.7	0.7	0	6.9	0	0
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	0	0.1	0	0	0	11.9	0.2	0	0	1.7
Herring	0	0	0	0	0	0	0	0	0	0
Sculpins	0.2	0	0	0	0	0	0	0	0	1.1
Other Forage Fish	0	0	0	0	0	0	0	0	0	0.2
Other Roundfish	2.4	0	0	0.6	4	19.1	0.6	0	0.2	0.1
TOTAL ROUNDFISH	28.9	74	40.5	3.6	11.9	143.5	60	412.7	157.6	32.7
Arrowtooth Flndr	90.7	11.9	18.3	49.6	91	122.8	42.4	1.7	91.5	84.4
Flathead Sole	14.7	1.7	4.7	6.3	37.5	54.2	85.6	424.4	91.5	86.8
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	0	0.8	0	1.3	0.9	0.1	2.3	0	5.5	9.6
Dover Sole	0	0.6	0	0	2.3	19.5	0	0	0	0
Pac Halibut	0	0	0	1.3	0	6.7	0	7	0	0
Starry Flndr	0	0	0	0	0	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	105.4	14.9	23	58.5	131.6	203.4	130.3	433.1	188.5	180.9
Pink Shrimp	45.7	0.2	70.2	2	41.9	54.9	57.4	23.2	128.9	249
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0	0
Sidestriped	5.3	0	2.1	0	0.9	3.8	1.9	22.1	1.8	5
Other Shrimp	0.2	0	0.1	0	0.1	0.1	0.2	0.1	0.3	0.4
TOTAL SHRIMP	51.2	0.2	72.4	2	43	58.9	59.6	45.4	131	254.4
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	5.5	2.9	4.1	2	7	0.1	0	0	0.2	4.4
TOTAL INVERTS	5.5	2.9	4.1	2	7	0.1	0	0	0.2	4.4
Skates	0	0	0	0	0	0	0	8.7	0	8.2
Spiny Dogfish	10.4	0	1.9	0	0	0	0	4.7	0	0
Other	1.7	0.1	0.7	0	0.8	0.1	0	0	0	0
TOTAL CATCH	203.3	92.1	142.5	66.1	194.3	406	249.9	904.7	477.3	480.5

-Continued-

Appendix A. (page 10 of 11)

Haul	91	92	93	94	95	96	97	98	99	100
Location	Marmot I	Marmot B	Marmot B	Marmot B	Marmot B	Marmot B	Marmot B	Marmot B	Marmot B	Marmot B
Month/Day/Year	10/12/02	10/12/02	10/12/02	10/12/02	10/12/02	10/12/02	10/12/02	10/13/02	10/13/02	10/13/02
Station	467	441	423	418	409	428	429	402	407	415
Longitude Start	152 18.0	152 31.1	152 33.5	152 37.3	152 39.7	152 35.1	152 35.3	152 47.6	152 40.7	152 37.0
Latitude Start	58 4.5	57 59.3	58 0.7	57 58.9	57 58.0	58 8.6	58 7.1	57 52.9	57 55.8	57 57.2
Heading, Degrees	233	27	194	30	20	191	170	35	180	270
Average Depth (m)	183	165	219	133	128	104	119	91	104	132
Distance Fished (km)	1.3	1.1	1.1	0.9	1.1	1.1	1.1	0.6	1.3	1.3
Bottom Temperature	6.6	6.7	6.6	7	7	7	7	7.8	7.5	7
Performance	1	1	1	1	1	1	1	1	1	1
					KILOGRAMS/KILOMETER					
Pollock	73.3	58	47.9	35.1	77	123.2	292.8	20.2	8.3	27.4
Pacific Cod	17.8	2.3	11.6	0	5.1	0	0	5	0	2.3
Pacific Sandfish	0	0	0	0	0	0	0	0	0	0
Eulachon	0	0.8	0.7	0	0	0	0	0	0	0
Capelin	0	0	0	0	0	0	0	0	0	0
Rockfish	1.3	0.6	0.4	0	0.3	0	0	0	0	0.4
Herring	0	0.1	0	0	0	0	1	0	0	0
Sculpins	0	0	0.2	0	0	0	0.1	0	0	0
Other Forage Fish	0	0.4	0.7	0	0	3.2	0	0	0	0
Other Roundfish	5.7	0.1	0.1	0.8	0.8	1.9	0.9	0	1.1	0
TOTAL ROUNDFISH	98.1	62.3	61.7	35.9	83.2	128.3	294.9	25.1	9.4	30.1
Arrowtooth Flndr	46	81.9	68.8	20.4	7.5	26	9	27	70.8	63.4
Flathead Sole	47.9	79.8	89.9	23.7	52.7	218.2	83.1	10.8	69.4	93.6
Rock Sole	0	0	0	0	0	0	0	0	0	0
Rex Sole	3.2	6.9	11.2	0.2	7.8	0	0	0	0	7.8
Dover Sole	0	0	0	0	0	0	0	0	0	0
Pac Halibut	0	0	7.1	0	0.7	0	0	0	3.4	0
Starry Flndr	0	0	0	0	0	13.7	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0	0	0
TOTAL FLATFISH	97	168.6	177.1	44.4	68.7	258	92.1	37.7	143.6	164.7
Pink Shrimp	73.1	90.1	140	25	44.4	4.7	12.7	0.1	1.1	61.3
Humpy Shrimp	0	0	0	0	0	0	0	0	0	0
Coonstriped	0	0	0	0	0	0	0	0	0.1	0
Sidestriped	1.5	3	4.8	0.1	0	0	1.8	0	0	1
Other Shrimp	0.1	0.2	0.5	0	0.7	0	0	0	0.4	0.4
TOTAL SHRIMP	74.8	93.2	145.2	25.1	45.1	4.7	14.5	0.1	1.6	62.7
Euphasiid	0	0	0	0	0	0	0	0	0	0
Other Inverts	4.5	24.8	8.6	0.8	17.3	12.2	1.9	14.2	2.3	0
TOTAL INVERTS	4.5	24.8	8.6	0.8	17.3	12.2	1.9	14.2	2.3	0
Skates	0	0	0	0	12	0	0	0	0	0
Spiny Dogfish	2.3	0	3.3	2.6	4.8	3.2	1.8	5.3	0	4.1
Other	0.9	0.3	0	0	2.8	2	1.5	0	0.3	0.6
TOTAL CATCH	336.3	349.1	395.9	108.7	233.9	408.5	406.7	82.4	157.3	262.2

-Continued-

Haul	101	102	103	104	105	106	107	108
Location	Marmot B	Kiliuda	Kiliuda	Kiliuda	Kiliuda	Kiliuda	Kiliuda	Kiliuda
Month/Day/Year	10/13/02	10/15/02	10/15/02	10/15/02	10/15/02	10/15/02	10/16/02	10/16/02
Station	426	159	157	152	149	142	161	166
Longitude Start	152 33.9	152 59.0	152 56.4	152 54.7	152 58.3	153 6.9	152 52.2	152 45.3
Latitude Start	57 57.4	57 18.7	57 17.8	57 13.6	57 12.9	57 11.3	57 13.8	57 13.0
Heading, Degrees	32	151	147	270	270	60	90	308
Average Depth (m)	152	82	93	119	117	121	119	139
Distance Fished (km)	1.3	1.1	1.9	1.5	1.3	1.9	0.7	1.1
Bottom Temperature	6.9	7.3	7.4	6.5	6.1	6.1	6	5.5
Performance	1	1	1	1	1	1	1	1
				KILOGRAMS/KILOMETER				
Pollock	9.5	186.6	61.6	53.6	44	18.4	17.1	4.3
Pacific Cod	4.7	1.9	1.3	0	3.1	0	5	1.6
Pacific Sandfish	0	0	0	0	0	0	0	0
Eulachon	0	1.3	1.6	0.2	0	0	0	0
Capelin	0	0	0	0	0	0	0	0
Rockfish	1.8	0	0	0	0.2	0	0	0
Herring	0	0	0	0	0	0	0	0
Sculpins	0.1	0.4	0.2	0	0	10.5	1	1.8
Other Forage Fish	0	0	0	0	0	0	0	0
Other Roundfish	1.6	3.3	1.4	0.2	1.9	1.1	0.1	0.9
TOTAL ROUNDFISH	17.7	193.5	66.2	54	49.2	30.1	23.3	8.5
Arrowtooth Flndr	93.2	0.9	30.9	16.6	82.9	173.4	72.5	157.5
Flathead Sole	80	22.6	51.4	35.2	27	130.3	40.6	80.6
Rock Sole	0	0	0	0	0	0	0	0
Rex Sole	8.4	0	0	0.8	2.7	0.9	0	9.7
Dover Sole	0	0	0	0	0	0.7	0	12.8
Pac Halibut	0	4.6	0	7.6	0	0	0	0
Starry Flndr	0	16.1	48.2	0	0	0	0	0
Yellowfin Sole	0	0	0	0	0	0	0	0
Other Flatfish	0	0	0	0	0	0	0	0
TOTAL FLATFISH	181.6	44.3	130.5	60.2	112.7	305.2	113.1	260.6
Pink Shrimp	45.5	1.1	25	0.6	20	23.4	6.2	71.7
Humpy Shrimp	0	0	0	0	0	0	0	0
Coonstripe	0	0	0	0	0	0	0	0
Sidestripe	1.1	0	0	0	0	0	0	0
Other Shrimp	0	0	0.1	0	0	2	0	0.2
TOTAL SHRIMP	46.5	1.2	25.1	0.6	20	25.4	6.2	71.9
Euphasiid	0	0	0	0	0	0	0	0
Other Inverts	5.8	5.6	2.5	8	20	28	1.2	29
TOTAL INVERTS	5.8	5.6	2.5	8	20	28	1.2	29
Skates	0	40	0	0	0	0	0	0
Spiny Dogfish	1.4	3	0	3.6	0	1.1	0	0
Other	3	0.4	0.4	0.4	0.1	0.1	0	0.6
TOTAL CATCH	256.1	287.9	224.6	126.8	202	389.8	143.8	370.7

Appendix B.1. Walleye pollock lengths from the 2002 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
6	0	0	0	0	0	0	2	1	0	1	0	0	0	0	3
7	0	0	2	0	1	0	2	2	0	6	2	0	0	1	2
8	2	2	7	0	11	5	10	15	1	23	3	0	0	1	10
9	7	9	9	1	70	28	8	17	1	43	20	0	0	10	17
10	38	48	13	2	272	23	7	7	10	40	28	2	0	3	11
11	48	83	4	8	170	10	1	1	11	34	10	0	0	0	5
12	79	59	2	4	35	1	0	0	8	8	5	0	0	0	0
13	25	20	0	9	1	0	0	0	1	0	0	0	0	0	0
14	15	7	0	1	2	0	0	0	0	0	0	0	0	0	0
15	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
18	0	0	0	0	0	1	0	0	0	0	0	0	0	0	5
19	0	0	0	0	0	2	0	0	3	0	0	0	0	0	18
20	0	0	0	0	6	0	2	0	18	3	0	0	0	0	14
21	0	0	0	0	10	0	0	0	21	1	0	0	0	0	14
22	1	1	0	2	42	0	1	0	31	7	0	3	0	0	3
23	0	0	1	0	24	0	0	0	11	8	0	0	0	0	3
24	1	1	0	0	22	0	1	0	9	6	0	4	0	0	1
25	1	1	2	0	5	1	0	0	8	2	0	1	0	0	0
26	2	2	0	2	1	0	1	0	1	1	0	2	1	0	0
27	2	3	2	1	0	0	2	0	1	3	0	0	0	0	0
28	2	3	1	1	1	0	3	0	1	1	0	2	0	0	1
29	5	0	1	0	0	0	1	2	0	2	1	2	0	0	3
30	2	0	3	0	0	0	1	0	5	5	0	5	3	0	3
31	12	3	8	0	0	0	1	0	6	15	0	1	1	0	0
32	13	5	16	2	0	1	1	0	14	16	1	5	3	1	0
33	21	6	24	3	0	0	0	0	12	22	2	3	9	0	0
34	19	12	22	4	0	0	0	1	14	22	3	10	7	2	0
35	27	13	17	5	0	1	0	1	12	14	2	12	12	4	1
36	27	8	24	4	0	2	3	0	11	17	1	11	5	3	1
37	29	9	9	5	0	3	4	2	3	16	3	16	7	6	0
38	18	6	20	10	0	1	2	1	3	10	4	6	8	7	0
39	8	9	8	7	0	2	4	2	6	14	4	7	2	6	0
40	3	10	5	4	0	1	2	3	3	10	0	4	8	7	1
41	4	9	14	3	0	2	5	7	14	22	8	8	6	10	0
42	3	7	15	3	0	1	1	8	14	14	4	4	5	4	2
43	8	11	10	3	0	3	1	8	23	11	4	9	9	3	0
44	5	7	8	2	0	2	4	4	25	10	3	13	4	10	0
45	9	7	5	1	0	2	5	8	33	10	1	6	7	4	1
46	10	7	8	3	0	3	3	9	30	11	1	3	2	4	1
47	7	6	8	2	0	2	4	5	41	13	2	6	6	3	0
48	6	7	3	2	0	0	2	11	18	12	0	7	1	2	1
49	6	7	6	2	0	1	7	13	25	3	1	4	2	1	2

-Continued-

Appendix B.1. (page 2 of 2)

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
50	2	10	5	6	0	5	6	11	14	4	1	0	0	3	0
51	9	4	8	4	0	3	12	14	12	5	4	4	0	5	0
52	7	6	6	6	0	3	5	12	6	13	1	2	2	7	0
53	6	6	5	4	0	5	4	18	14	10	3	0	1	3	1
54	5	4	4	9	0	6	5	4	11	14	0	0	0	2	0
55	5	2	2	6	0	4	9	14	9	19	4	2	1	6	1
56	5	7	2	3	0	6	2	7	8	10	2	1	0	8	1
57	1	6	3	4	0	4	5	13	3	10	0	1	1	5	4
58	2	5	0	0	0	2	4	15	5	13	2	1	1	3	0
59	4	3	2	5	0	3	1	2	5	14	0	2	0	1	3
60	3	3	5	5	0	6	1	9	2	7	2	2	0	2	0
61	3	4	3	1	0	6	0	6	8	4	0	1	0	1	2
62	3	6	2	1	0	1	0	2	4	5	2	1	0	1	1
63	4	7	4	2	0	1	0	1	1	6	0	1	0	0	0
64	3	3	7	2	0	1	1	1	0	1	0	0	0	0	0
65	2	6	3	4	0	0	0	0	4	5	1	0	0	0	0
66	3	4	1	3	1	0	0	0	1	1	0	1	0	0	0
67	2	2	1	2	0	0	0	0	0	2	0	0	0	1	0
68	2	0	1	2	0	0	0	1	0	0	0	0	0	0	0
69	4	3	2	2	0	0	0	0	0	1	0	0	0	0	0
70	1	1	0	2	0	0	0	0	0	1	0	0	0	0	0
71	1	0	0	2	0	0	0	0	0	0	0	0	0	0	1
72	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
73	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
75	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
78	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B.2. Flathead sole lengths from the 2002 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
6	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
7	1	0	0	0	0	2	1	0	1	1	0	0	0	0	0
8	1	2	0	0	0	4	2	1	5	3	0	0	0	0	4
9	5	1	0	5	3	1	1	3	5	3	0	0	0	0	4
10	2	4	1	8	5	3	0	2	4	1	0	2	0	0	1
11	8	5	3	9	1	2	0	0	3	1	1	0	0	2	2
12	0	1	0	2	1	1	4	2	5	0	0	0	0	0	2
13	0	3	0	3	1	1	7	2	3	4	0	0	0	3	5
14	1	2	0	10	0	1	6	4	3	4	0	0	0	6	3
15	0	0	1	11	4	0	15	13	6	1	0	0	0	8	4
16	2	9	3	9	2	4	23	11	10	4	0	2	2	16	6
17	1	5	2	8	2	8	14	8	15	0	1	1	3	8	2
18	2	11	4	16	2	6	13	6	8	2	1	0	2	12	1
19	5	11	5	7	5	5	9	6	15	2	1	4	0	4	2
20	8	15	7	9	6	9	6	3	23	5	0	7	0	6	5
21	7	19	5	10	1	2	3	5	26	4	3	2	2	7	1
22	13	13	12	11	3	7	10	5	30	8	2	2	1	7	7
23	13	10	21	8	6	6	5	2	36	11	6	3	0	11	2
24	15	14	17	2	7	3	7	4	54	6	8	1	0	6	6
25	21	12	17	5	6	2	12	11	39	10	1	0	0	2	7
26	15	10	25	7	5	5	9	14	55	8	5	4	1	11	5
27	20	9	11	6	2	4	7	4	46	9	6	3	2	4	4
28	22	11	12	4	1	5	11	5	58	9	11	0	1	12	10
29	19	8	14	8	1	7	7	17	47	17	1	3	3	19	11
30	23	8	15	14	1	13	11	14	54	15	5	7	2	9	19
31	17	10	19	6	1	5	11	18	61	7	2	2	6	5	17
32	30	11	14	19	0	12	19	21	77	26	9	6	5	5	24
33	26	17	27	14	1	7	24	27	78	23	8	3	3	4	16
34	27	11	17	15	0	10	35	28	68	30	2	10	4	9	17
35	22	9	24	22	0	8	25	28	46	42	4	4	4	7	17
36	30	9	26	17	0	10	28	20	50	24	5	0	1	2	23
37	21	21	23	9	0	8	16	19	26	29	6	3	1	3	11
38	21	16	21	12	0	6	17	9	18	14	3	0	1	3	8
39	18	19	12	10	0	2	5	9	12	17	0	0	4	3	3
40	11	15	20	7	0	5	6	11	12	16	7	1	6	4	1
41	11	19	8	5	0	4	8	10	8	11	2	2	6	1	0
42	10	7	12	7	0	2	2	8	6	8	0	1	0	1	2
43	8	7	8	9	0	0	2	6	5	8	0	0	0	1	0
44	3	8	6	8	0	0	1	1	6	6	0	0	0	1	1
45	1	6	3	8	0	0	0	0	2	2	0	0	1	1	0
46	2	6	3	2	0	1	0	1	1	0	1	0	1	1	0
47	0	3	1	0	0	0	0	1	2	0	0	0	0	0	0
48	0	2	0	0	0	0	0	1	2	0	1	0	0	0	0
49	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Appendix B.3. Arrowtooth flounder lengths from the 2002 small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
6	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0
7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0
11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
14	0	2	1	0	0	0	1	0	0	0	0	0	0	6	0
15	0	4	0	1	0	5	1	0	1	0	0	2	0	4	0
16	0	14	0	0	0	1	2	0	0	1	0	1	0	2	0
17	1	4	0	2	0	3	1	0	2	0	0	0	0	0	0
18	1	10	2	2	1	0	0	0	0	1	1	0	0	0	0
19	4	2	3	1	0	0	1	0	1	0	2	0	0	1	0
20	5	4	1	6	2	0	0	2	0	1	1	0	0	0	0
21	3	2	2	1	0	1	0	0	0	0	0	0	0	0	0
22	6	7	2	1	1	2	0	0	0	0	0	0	0	0	0
23	3	11	2	0	0	2	0	2	0	2	1	0	0	0	0
24	13	12	6	1	0	3	0	3	0	0	0	0	0	0	0
25	13	13	5	2	0	3	5	4	1	0	1	0	0	3	1
26	20	24	10	3	0	1	9	5	3	4	0	1	0	3	1
27	21	17	14	1	0	4	4	6	4	5	0	0	0	1	2
28	41	26	23	6	0	5	5	7	11	6	0	0	0	2	2
29	25	28	29	6	0	3	5	20	15	11	2	2	0	1	1
30	32	26	29	7	0	5	5	20	24	17	1	2	0	1	2
31	29	23	20	5	0	3	6	14	17	21	2	1	0	1	2
32	30	21	21	6	0	6	8	13	37	17	1	9	0	1	3
33	25	15	4	3	0	3	4	15	25	18	4	2	0	0	4
34	14	15	6	6	0	1	0	16	29	12	1	3	0	3	1
35	10	12	3	6	0	3	2	8	9	5	4	0	1	1	1
36	7	10	3	8	0	1	2	5	13	11	0	0	0	2	2
37	9	3	2	5	0	2	2	4	17	9	2	0	0	1	3
38	4	4	2	0	0	2	2	3	19	7	0	0	0	2	2
39	2	4	1	2	0	2	2	4	11	5	1	1	0	0	3
40	2	8	0	0	0	1	7	9	10	8	1	0	0	3	2
41	2	8	1	0	0	1	3	5	9	6	0	0	0	3	3
42	3	3	1	1	0	1	4	5	4	7	0	0	0	1	1
43	1	7	1	1	0	2	5	4	8	6	0	0	0	1	5
44	1	4	0	1	0	4	4	3	6	4	0	0	1	1	0
45	4	5	0	0	0	1	5	1	6	5	0	0	0	1	2
46	4	7	2	0	0	0	2	6	3	5	0	0	0	1	1
47	1	4	0	1	0	1	7	4	2	5	0	0	0	0	1
48	1	2	0	1	0	1	4	7	1	2	0	0	0	3	0
49	0	6	1	3	0	2	3	4	2	2	0	0	0	1	4
50	2	3	0	1	0	2	5	2	5	2	1	0	0	2	2
51	1	5	1	3	0	2	4	1	2	1	0	0	0	2	1
52	0	1	0	5	0	1	3	2	2	1	0	0	0	2	1
53	1	3	0	4	0	3	2	2	0	7	0	0	0	0	3

-Continued-

Appendix B.3. (page 2 of 2)

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
54	0	4	3	3	0	1	3	5	1	0	0	0	0	1	0
55	0	2	0	2	0	2	1	3	1	4	0	0	0	1	0
56	0	3	1	4	0	3	1	5	2	4	0	0	0	0	0
57	0	2	0	7	0	2	1	1	3	0	0	0	0	0	1
58	2	4	1	4	0	0	0	2	1	1	1	0	0	0	0
59	4	2	1	5	0	0	0	0	1	1	0	0	0	3	0
60	0	2	0	1	0	0	1	0	3	1	0	0	0	2	1
61	3	1	0	0	0	1	1	0	2	0	0	0	0	0	0
62	2	2	0	3	0	0	0	1	0	0	0	0	0	0	0
63	0	4	2	0	0	0	1	0	2	0	0	0	0	0	0
64	2	2	0	2	0	0	2	0	1	0	0	0	0	0	0
65	0	1	0	2	0	0	0	0	1	0	0	0	0	0	0
66	0	2	0	4	0	0	0	0	0	1	0	0	0	0	0
67	1	2	0	2	0	0	1	1	0	0	0	0	0	0	0
68	0	0	0	3	0	1	0	0	1	0	0	0	0	0	0
69	0	1	0	1	0	0	0	1	1	1	0	0	0	0	0
70	1	1	0	1	0	1	0	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
72	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1
73	0	0	0	0	0	1	1	1	1	0	0	0	0	1	0
74	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
75	0	0	0	1	0	0	1	0	0	0	1	0	0	0	0
77	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0
78	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0
81	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0

Appendix A.4. Pacific cod lengths from the 2002 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
11	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
38	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
40	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
41	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
42	0	0	0	0	0	0	0	0	4	0	0	0	1	0	0
43	0	1	0	0	0	0	0	0	1	0	0	2	0	0	0
44	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
45	0	0	2	0	0	0	2	0	1	0	0	1	0	0	0
46	0	0	0	0	0	0	0	0	0	0	0	3	1	0	0
47	0	1	0	0	0	0	0	1	1	0	0	2	0	0	0
48	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0
49	0	4	2	0	0	0	0	0	0	0	0	0	0	0	0
50	1	8	0	0	0	0	0	2	2	0	0	2	0	0	0
51	0	2	1	0	0	0	0	1	3	0	0	1	0	0	1
52	4	2	0	0	0	0	0	0	3	3	0	0	0	0	0
53	0	5	1	0	0	0	2	0	3	2	0	2	0	0	0
54	1	10	0	0	0	0	0	0	2	2	0	1	0	0	2
55	2	6	0	0	0	0	0	1	1	0	0	1	1	0	0
56	0	3	1	1	0	0	0	4	3	0	0	3	1	0	1
57	0	6	1	0	0	0	1	2	4	3	0	0	0	0	0
58	0	1	2	0	0	0	1	0	4	2	0	0	0	0	1
59	0	3	0	1	0	0	0	1	0	1	0	1	0	0	0
60	0	1	0	0	0	0	1	0	2	3	0	0	0	0	0
61	0	3	0	0	0	0	0	1	2	0	0	0	0	0	0
62	0	4	0	1	0	0	2	1	4	2	0	1	2	0	1
63	0	3	3	0	0	0	0	2	3	6	1	1	0	0	0
64	1	3	2	0	0	0	1	1	2	4	0	0	1	1	1
65	2	3	0	1	0	0	0	0	2	4	0	1	0	1	1
66	0	3	2	0	0	0	0	0	0	2	0	0	0	0	0
67	0	7	0	0	0	0	0	0	1	0	1	0	0	0	1
68	1	6	4	0	0	0	3	0	1	4	0	1	0	0	2
69	0	2	3	0	0	0	0	1	2	6	0	0	0	1	1
70	0	6	1	1	0	0	0	0	1	3	0	0	0	1	1
71	0	9	2	0	0	0	0	0	1	1	0	0	0	0	0
72	1	5	1	0	0	0	0	0	1	0	0	0	0	0	0
73	0	4	1	0	0	0	0	0	1	2	0	0	0	0	0
74	0	3	1	0	0	0	0	0	0	1	0	0	0	0	0

-Continued-

Appendix B.4. (page 2 of 2)

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
75	1	3	0	0	0	0	0	2	0	2	0	0	1	0	0
76	0	2	3	0	0	0	0	1	1	1	0	0	0	0	0
77	0	1	0	0	0	0	0	1	1	1	0	0	0	0	0
78	0	2	2	0	0	0	1	0	0	1	0	0	0	0	0
79	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0
80	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
83	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
86	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B.5. Eulachon lengths from the 2002 Westward Region small-mesh trawl survey.

length (cm)	Marmot Bay	Marmot Island	Chiniak Bay	Kiliuda Bay	Wide Bay	Mitrofania Island	Stepovak Bay	Balboa/Unga Strait	Pavlof Bay	Chignik Bay	Kujulik Bay	Bearver Bay	Belkofski Bay	Ivanof Bay	Kuiukta Bay
6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
7	0	0	0	0	0	0	9	0	0	0	0	0	0	25	6
8	0	0	0	0	0	1	25	0	0	0	0	0	0	97	60
9	0	4	0	0	0	2	14	0	0	2	0	0	0	51	33
10	0	23	0	0	0	3	4	0	0	2	0	0	0	8	7
11	0	14	0	0	0	1	0	0	0	7	0	0	0	1	0
12	0	16	0	0	0	6	3	0	0	0	0	0	0	3	0
13	0	6	0	0	0	21	12	0	0	10	0	0	0	8	0
14	0	4	0	0	0	46	31	0	0	22	0	0	0	2	4
15	0	7	0	0	0	54	58	1	0	28	0	0	0	7	5
16	0	11	0	0	0	69	89	5	0	18	7	0	0	16	10
17	0	8	0	0	0	34	105	10	0	21	3	0	0	15	11
18	1	16	0	0	0	46	111	25	0	33	15	0	0	28	21
19	2	14	0	1	0	44	129	52	0	63	25	0	0	23	12
20	1	13	0	1	0	42	110	94	0	114	25	0	0	17	35
21	0	4	0	2	0	17	43	64	0	81	9	0	0	6	15
22	1	5	0	2	0	3	3	16	0	30	2	0	0	1	5
23	0	0	0	2	0	0	1	3	0	7	0	0	0	0	2
24	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0